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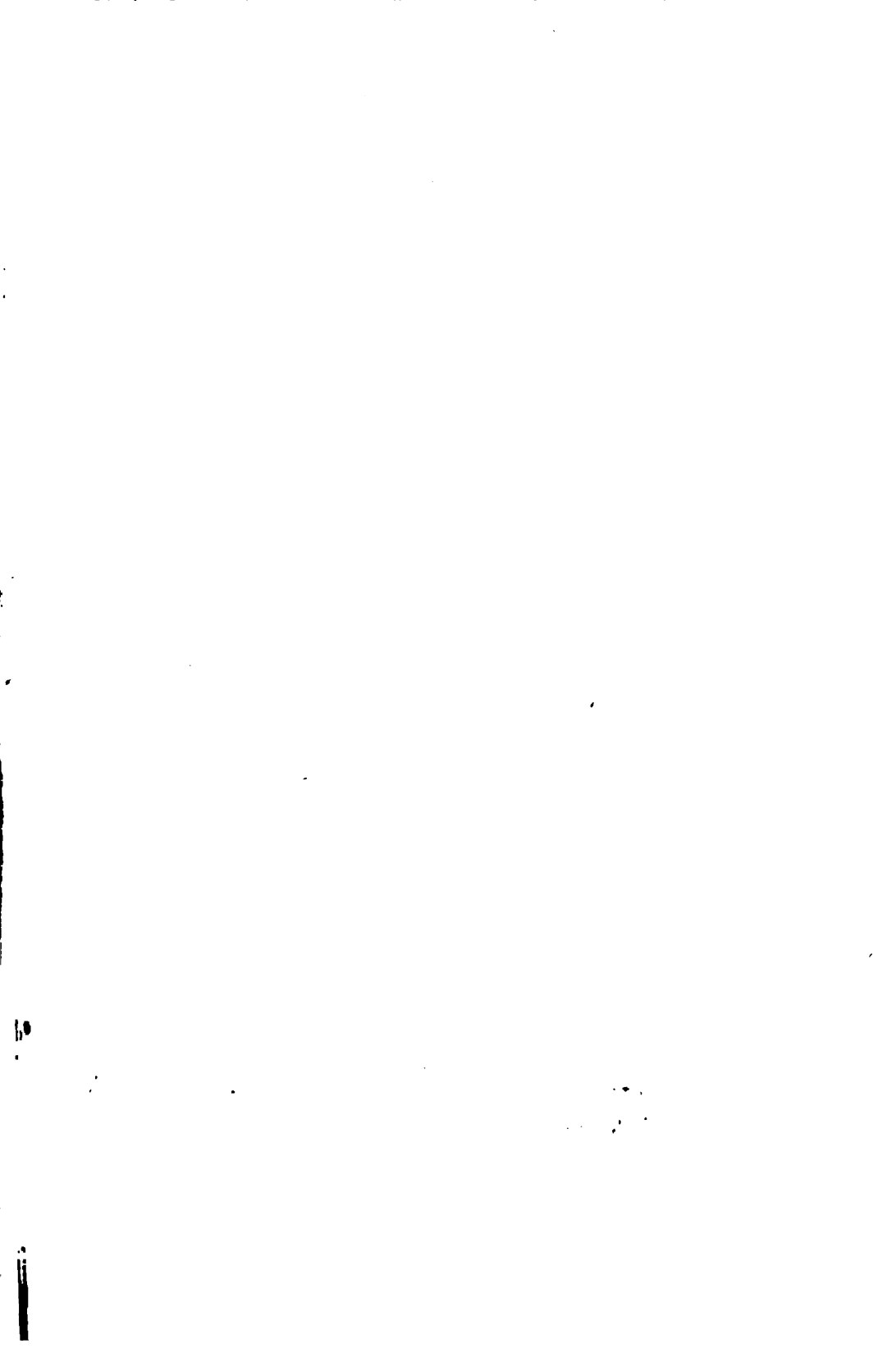
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FROM

*The Chief Fire Warden  
The State of Minnesota.*

*28 June, 1897 - 7 July, 1899*

Complete Set Deposited  
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APR 18 1941











6  
FOREST PRESERVATION

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# SECOND ANNUAL REPORT

OF THE

## CHIEF FIRE WARDEN

OF

## MINNESOTA

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UNDER THE ACT OF THE LEGISLATURE ENTITLED  
"AN ACT TO PROVIDE FOR THE PRESERVATION OF FORESTS OF THIS STATE  
AND FOR THE PREVENTION AND SUPPRESSION OF FOREST AND  
PRAIRIE FIRES," APPROVED APRIL 18, 1895.

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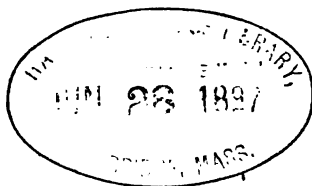
FOR THE YEAR 1896.

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ST. PAUL, MINN.:  
PRINTED BY THE PIONEER PRESS COMPANY,  
1897.

~~V. 5520~~ ~~For 1521.3~~

31



*The Chief Fire Warden*

**Complete Set Deposited  
in Littauer Center**

**APR 18 1941**

STATE OF MINNESOTA,  
OFFICE OF CHIEF FIRE WARDEN,  
ST. PAUL, May 27, 1897. }

*Hon. R. C. Dunn, State Auditor and Forest Commissioner,*

SIR: As required by section 3 of the Act for the Preservation of Forests, etc., approved April 18, 1895, I have the honor to submit, herewith, my annual report for the year 1896.

Very respectfully,

C. C. ANDREWS,  
*Chief Fire Warden.*

# SECOND ANNUAL REPORT

OF THE

# CHIEF FIRE WARDEN

OF MINNESOTA.

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In reviewing operations under the Forest Preservation Act one should bear in mind the very large extent of territory to be protected and the extremely economical plan on which the work has to be done. Fire wardens who have to be relied upon to take precautions to prevent the setting of forest and prairie fires, and to extinguish such fires if they occur, are paid for not exceeding fifteen days' service in a year and at the rate of two dollars per day. It is very seldom that a fire warden is paid for half that number of days. Their helpers can be paid for not more than five days in a year at the rate of one dollar and fifty cents a day. Two-thirds of the expenses are borne by the county in which they are incurred and the state pays the other third. But no county can expend, under this law, more than \$500 in a year.

## DANGEROUS SEASON OF 1896.

The matter of most interest during the past year was the very dry and dangerous weather which prevailed in the Lake Superior region during most of the months of August and September. It was just the same sort of weather which

prevailed in Northern Michigan at the same time—a state which had no fire warden service—and where a forest fire caused the destruction of property amounting to several million dollars.<sup>1</sup> The most serious fires which occurred in

<sup>1</sup>*Pioneer Press, Aug. 26, 1896:*

GREEN BAY, WIS., Aug. 25.—Ontonagon, Mich., was destroyed by fire this afternoon. Of the city of about 2,000 population hardly a house is left standing. Among the property destroyed is the extensive plant of the Diamond Match Company and 6,000,000 feet of lumber in their yards. Conservative estimates place the loss at \$1,500,000. No lives were lost at last reports. Communication has been cut off since 5 P. M., and no further news will be possible until morning. The fire had been burning in the woods southwest of the city for two weeks. It was nearly out when a southwest gale yesterday and to-day swept in upon the town. At noon it was seen that the city was doomed. A message was sent to Supt. Minturn, of the St. Paul road at Green Bay, asking for a train to take the people away. The operator who sent the message was driven away from his instrument by the burning of the building. A train was ordered there from Pori, twenty-six miles south. The train reached Ontonagon and took a load of people to Rockland, ten miles away. It left again for Ontonagon for another load and since then nothing has been heard from them. At 5 o'clock the flames had swept through the main part of the city, destroying all the business houses, many residences, the match company's mills, the water works, electric light plant, courthouse, jail, etc. The flames then worked up the river to the rest of the city..

At midnight to-night the entire city is practically in ashes and two thousand people are homeless without clothing or shelter. Of this number 1,500 are in absolute want. The fire has swept away nearly every dwelling house, all stores and other places of business and all the big mills and other manufacturing plants. Whether or not there has been loss of life cannot be learned to-night. If no one perished in the wave of fire that swept from woods to lake it is little short of miraculous.

*Pioneer Press, Aug. 27:*

GREEN BAY, WIS., Aug. 26.—Advices received by railroad officials from stations within a few miles of Ontonagon are to the effect that only fifteen houses are left standing, but that no lives were lost. The heat from the burning mills and lumber was so intense that the people were compelled to seek shelter under trees and driftwood along the lake shore. Many walked to Rockland, fifteen miles away. There are about 1,800 men, women and children without food or shelter. Many are insufficiently clothed, and they suffered severely last night.

The Diamond Match Company lost two fine saw mills, having a daily capacity of 450,000 feet, and other mills and buildings worth in all nearly \$2,000,000 and lumber worth nearly \$1,000,000. Insurance to the extent of \$750,000 was carried with the Fleischeim agency of Menominee and the Douglas & Van Orden agencies at Houghton. The loss on the balance of the village will foot up about \$2,000,000, with \$300,000 insurance. The fire is still burning in the lumber piles and it is impossible to go among the ruins. Houghton and Hancock are raising provisions and clothing. Money is needed badly.

Minnesota were two causing damage to the amount of about \$5,000 each. As showing with more particularity the dangerous situation in this state I will here quote the preliminary report and annexed correspondence which I submitted at the close of the year:

OFFICE OF CHIEF FIRE WARDEN, }  
ST. PAUL, Dec. 31, 1896. }

*Hon. R. C. Dunn, State Auditor and Forest Commissioner:*

SIR: In the form of a brief preliminary report I beg to hand you herewith a copy of some of the correspondence of this office, mostly communications from fire wardens, showing the danger of forest fires which prevailed in the Lake Superior region during the past season. It does not include all of the forest fires which occurred but it includes the more serious ones. In almost the entire Lake Superior region there was dry and dangerous weather for several weeks. I invite your particular attention to the contrast between the situation in this state and in Michigan, which has no fire warden law. On the 25th of August the village of Ontonagon, Mich., with property to the amount of several million dollars, was destroyed by a forest fire which had been previously burning in the woods southwest of the village for two weeks. The weather was just as dry and dangerous in Minnesota as in Michigan, and, although forest fires occurred in this state, nothing happened which could in any degree be compared with the calamity at Ontonagon. If we had no fire warden law people would, of course, turn out to protect their own property from fire and their neighbors would help them. But how about the forest fire burning some distance away, possibly on some non-resident's land? That is the kind of fire—if we had no fire warden law—most likely to be neglected, and therefore most likely finally to prove dangerous. It is the business of fire wardens to look after such fires, as well as others, and have them extinguished.

No one should claim for this law all the credit of preventing and extinguishing forest fires in Minnesota the past season, but to deny that it proved of very considerable public benefit would be unjust to many fire wardens and their helpers, whose activity was effective and praiseworthy. With further experience on the part of those charged with the execution of the law it ought to prove still more effective.

Very respectfully,

C. C. ANDREWS,  
*Chief Fire Warden.*



## CORRESPONDENCE.

## AITKIN COUNTY.

E. Bakkila, of the town of Beaver, August 25th:

The weather has been dry here over two months. All is safe in respect to fire yet.

E. O. Brown, chairman town of Kimberly, August 27th:

The weather has been dry all summer with only a few small showers of rain. If there does not come a good soaking rain there is very much danger of fire this fall as the ground is as dry now as two years ago.

Same, October 1st:

It is very dangerous for fires in this section of the state and big fires are already started not far from this point. The closest watch is kept and everyone is as careful as possible, but the greatest danger is from bird hunters and railroad engines. The first named are traveling all over the woods this fall.

James McAskill, chairman town of Hazelton, August 30th:

We have had no rain here for a month and there is danger of fires. There are very few settlers in this part of the county, which is all heavy timbered and rank growth of grass. If the dry weather continues it will be hard to stop fires.

Anders Larson, of the town of Glen, September 30th:

No rain for the last two weeks. There is plenty of food for the fire as the grass and weeds are grown very thick through the woods.

## CARLTON COUNTY.

H. M. Waldref, chairman of the town of Mahtowa, September 22d:

It is very dry and great danger of fires at this place. There have been fires repeatedly kindled here for the past six weeks by the stock farm employes, by the owner's orders, and the whole place is on fire to-day.

October 3d, he reports:

Since receiving your letters I have not had time to report to you, have been so busy fighting fires. I have had four buildings, together with a lot of personal property and a fine park, burnt up. Total loss for myself \$3,000. Several persons have lost small quantities of hay from fire. At the present time the fire is completely under control. I have had out fighting fire about thirty-five men and four teams on an average of two and a half days each.

John A. Swanson, of the town of Atkinson, September 29th. [Telegram]:

Forest fires are endangering our homes and property. It is in the live timber and hay meadows now. Send us help.

D. Moses, president village council, Cloquet, September 30th:

Sent thirty-eight men to fire at Atkinson and Carlton.

H. H. Hawkins, president village council of Thomson, September 30th. [Telegram]:

Have all men here fighting fire in town of Thomson.

Same, October 3d. [By letter]:

Fires are now well under control and no danger is apprehended. I still keep men on guard.

President of village council of Barnum, September 30th. [Telegram]:

Have sent men to look after fires. Will report later. No immediate danger, however.

Asa Paine, president village council, Carlton, September 30th. [Telegram]:

Our town surrounded by fire and no help to spare; heavy fires raging in township.

Same date by letter:

I received your message regarding call for help and note your instructions. I have communicated with the chairman of the board of supervisors but we cannot see our way clear to send anyone from here as our town is surrounded by fire, and Mr. Sheils, chairman of the board of supervisors, has been rushing around night and day throughout his district impressing men where needed to avert greatest danger. I am doing the same in this village.

Same, October 1st:

There have been a number of buildings burned and an aggregate loss of \$2,000 in the townships of Mahtowa and Atkinson, Carlton county, from forest fires during the last three days. The great danger to Carlton and vicinity is passed, and although considerable standing pine timber has been damaged and an enormous amount of young pine burned, the actual damage will not be severe if the pine is cut this winter.

Peter Jackson, chairman of the town of Knife Falls:

A fire occurred September 24 and burnt over 200 acres of brush and meadow. Damage about \$50. It originated on Sec. 26 and is supposed to have been caused by clearing land. It was extinguished in two days by the help of fifty persons, including fire wardens, by use of shovels and by hauling water with teams. The reason so many were called to help was because the wind was blowing a gale and it looked for awhile very much as if Cloquet was in great danger.

M. C. Kimberly, general superintendent, Northern Pacific Railway Company, October 1st:

I telegraphed our local superintendent at Duluth this morning about the fires in that neighborhood, and he informs me that while there is a large quantity of smoke there is very little fire and it is confined to the underbrush. He thinks there is no danger of serious results, and states that he has given instructions to all employes on his division to watch it closely and do everything possible to prevent its spreading.

William Sheils, chairman of the town of Twin Lakes, October 2d:

Your letter of 30th at hand to-day. I have been in the woods fighting fire since Sunday morning in the vicinity of Wrenshall. The whole country is on fire. It seems impossible for me to spare a man out of this town. Every man is at work now at the fire and the country is going to suffer, the best we can do. I am using every means possible, but everything is so dry it is hard to stop it.

H. H. Hawkins, president Village Council of Thomson, September 30th:

Forest fires are raging in town of Thomson, north of village. Cause, section men burning right of way on D. & W. Ry. Have a large force of men at work to protect forest and property of farmers. Have promised them \$1.50 per day. Is that right? If possible will send some men to Atkinson to-morrow. I arose from a sick bed to write this, to tell you that we are doing all in our power to subdue the fires.

#### COOK COUNTY.

H. J. Redmyer, of unorganized Towns 58 and 59, Ranges 4 and 5 west, Lutsen, August 17th:

On the 23d July a forest fire, caused by lightning, occurred on Sec. 11, Township 59, Range 4 west; burnt over twenty-five acres of spruce and cedar, destroying the wood entirely and doing damage to the amount of \$100. A party had been taking out cedar posts some years ago and left all the brush and limbs; the lightning had struck a cedar tree and the fire spread into the dry brush. I had to row fourteen miles before I could get any help. The number of persons assisting was thirteen. We found a small stream near by, and the fire was extinguished by carrying water and by ditching around the edge of the fire. It took me one day before I got control of it, and fully six days before it was extinguished. I had two men employed four days. The weather was very dry, but cold nights.

Chester S. Durfee, of Grand Marais, September 28th:

There has been dry and dangerous weather about three months this summer. There is great danger of fires now and will be during October unless we get considerable rain.

J. E. Johnson, of Township 61, Range 4 west, Lutsen, October 20th:

September was dry and we had a little fire started by some hunters on Secs. 11-61 and 22-61, Range 4. No danger at present.

George Wartner, of Gunflint Lake (via Port Arthur, Ontario), October 22d:

We had dry weather during June and September.

C. A. A. Nelson, of unorganized Towns 60, 61 and 62-2, Range 2 east, Lutsen, October 23d:

A forest fire, caused by campers, occurred in the southwest part of Township 60, Range 2, during dry weather which burnt over about two acres of light timber land but destroyed nothing of great value. Three persons were

called to help extinguish it, which was done by digging ditches, carrying water and felling trees. There has been dry and dangerous weather the past two months.

L. Eliason, of Hoveland, October 28th:

The weather has been dry and dangerous nearly all summer.

Bernt Jacobson, of unorganized Towns 63 and 64, Range 4 east, Hoveland, November:

There was dry weather about two months this season.

#### LAKE COUNTY.

Jacob Hangartner, of Beaver Bay, September 28th:

There has been dry and dangerous weather three months. There is fire in the bush. Should it continue dry there might be danger.

#### ST. LOUIS COUNTY.

Andrew Galbranson, of the town of Herman, September 24th:  
It has been quite dry all summer but not any fire.

John Peterson, of the town of McDavitt, September 25th:  
We have had dry weather for about six weeks.

C. M. Stevens, chairman town of Floodwood, September 25th:  
It is getting dry now and fire is liable to break out any time.

Same. October 3d. [Telegram]:  
Big fire in 53-21. I am called by settlers.

Henry Langten, of the town of Industrial, September 27th:  
We have had a large fire in our township, it has been burning for three days and I think danger is over.

Olaf Galbrandson, chairman of town of New Midway, September 28th:

No rain since July 4th to present time. Very dangerous now.

C. O. Eklund, of the town of Culver, September 29th:  
The weather has been dry and dangerous for the past three or four weeks.

Peter Fishan, chairman of the town of Herman, October 1st:  
We have had dry and dangerous weather all summer, and especially now. We haven't had rain for over four weeks. Several fires have broke out within the last few days caused, probably, by hunters. No damage done yet. We shall try our best to keep control of it.

James Erickson, chairman of town of Industrial, October 1st [Telegram]:

Whole county is afire; seems impossible to check it.

Same, October 5th:

Yours of October 1st at hand. We now have fire under control; have had some rain, and, as it is raining quite hard to-night, think further spread of fire impossible.

Henry Kirk, chairman of the town of Duluth, October 1st:

It is very dry and has been for six weeks. There are several fires in the forest burning now.

James Campbell, chairman of the town of Rice Lake, October 2d:

It has been very dry since August 1st. There are small fires burning now, started last Sunday. I have six men out now fighting fires; have been fighting fires since Tuesday last. Do not know how they started. Have got them pretty well under control.

D. M. Philbin, general superintendent, Duluth & Winnipeg Railroad, Duluth, October 3d:

I have your favor of the 1st. \* \* \* The woods are very dry and we fully appreciate the great danger at such times and will continue to do everything in our power to keep things safe in our district.

D. W. Owen, chairman of town of Breitung, October 5th:

The weather has been very dry here for the last two months. We have had a few fires in our township. As yet they have not done much damage.

### PRECAUTIONS AGAINST FIRES.

With a view of giving greater publicity to the Forest Preservation Act, I, in February, sent an extra copy of it to each chairman of town board, requesting that he would have it read at the annual town meeting occurring the second Tuesday of March. I at the same time inclosed a postal card by which he could inform me whether or not the request was complied with. The answers showed that the law was very generally read. The following is the circular which was sent to chairmen requesting to have the law read:

STATE OF MINNESOTA,  
OFFICE OF CHIEF FIRE WARDEN,  
St. Paul, Minn., Feb. 20, 1896.

*Mr..... Chairman.*

.....*Minn.*

SIR: You are requested to have the Act of April 18, 1895, for preventing forest and prairie fires, a copy of which is herewith transmitted, read at the annual meeting of your town to be held the second Tuesday of March, 1896; and if practicable immediately after the election of moderator, as it will then be more likely to be heard by the largest number in attendance. If the notices of the annual town meeting have not already been posted please request the clerk to mention such reading therein.

The rank vegetation caused by the wet weather of 1895 will make it dangerous in regard to fires should the months of April and May prove very dry. The majority of people are careful and law-abiding; but the carelessness or

wrong doing of one or two, here and there, in dangerous weather may work fearful injury. Fire wardens are required to have the law strictly observed in the limits of their respective towns by corporations as well as by individuals; and it is expected that every community will strongly uphold them in the faithful discharge of their duty.

Very respectfully,

C. C. ANDREWS,

*Chief Fire Warden.*

The question has been asked, How can a Chief Fire Warden at his office at the capital prevent, control, or extinguish forest and prairie fires? He can only do it through the local fire wardens and the citizens liable to be called upon as their helpers. His success will depend on the general forestry sentiment and good will of the public and on his ability to awaken in fire wardens zeal in the discharge of their duties. It is scarcely necessary for me to say that in selecting and appointing fire wardens (as I have to do in unorganized territory) no reference has ever been made to politics. I do not know the politics of a single fire warden. In all organized towns the three town supervisors are by law constituted fire wardens. In many towns different men are elected as supervisors every year, and consequently fresh instructions have to be sent to them. As showing the kind of appeal that is made to fire wardens from this office the following circular of instructions is given, which was transmitted the 9th of April on occasion of sending a fresh supply of placards:

STATE OF MINNESOTA,  
OFFICE OF CHIEF FIRE WARDEN,  
St. Paul, Minn., April 9, 1896.

*To the Chairman of the Board of Supervisors,*

*Town of.....*

*.....Minn.*

SIR: April and May are sometimes dangerous months in respect to forest and prairie fires, and this office ought, without delay, to be informed of the names and addresses of the newly elected supervisors, they being, under the act of April 18, 1895, fire wardens. Please inform me on within blank of the name, residence and postoffice of yourself and the other two fire wardens.

Probably there will be no need of changing the fire warden districts made last year.

There should be a few new warning placards posted in each town as a fresh reminder to people. I mail you a package which you will please have posted as prescribed by Section 4 of the aforesaid act.

You are requested to retain for yourself one copy of inclosed Circular No. 1, containing the Act of April 18, 1895, and have a copy delivered to each of the other newly elected supervisors.

Familiarity with the law will save a good deal of trouble.

You will see by Section 6 that fire wardens are to TAKE PRECAUTIONS TO PREVENT the setting of forest or prairie fires. The law, of course, does not prevent a person from burning brush or other material on his land, provided he does it in a suitable time of the year and takes reasonable precautions to prevent its spreading. But if he should start such a fire in dry weather or when there was a strong wind he would be negligent in the meaning of the law.

Fire wardens are clothed with the power and it is their duty to enforce the law in their towns. They will be held largely responsible that no dangerous fires occur. This is the second year of this new law, and, naturally, an improvement over the year 1895 will be expected. If we obtain as good results as possible from this law it will encourage the enactment of a better one. Our forests do now and for all time should continue to afford a great industry, the payment of wages to many workmen and a home market for farm products. They are a reservoir of moisture to feed our streams and fertilize our soil. Let school children and people of all ages be made to understand how important to their economical welfare is the preservation of the forests and they will become interested and active assistants in preventing forest fires. Try and enlist the interest of the enlightened and leading people of your town in the cause. See if meetings cannot be held and papers on the subject read. Through the board of trustees, see if the subject cannot properly receive attention in the schools; and, especially, endeavor to have something valuable accomplished on Arbor Day. The more interest fire wardens can awaken in the subject of forestry the easier will be their work of preventing forest fires and the sooner will we reach the time of a regulated consumption of the forests.

Very respectfully,

C. C. ANDREWS,

*Chief Fire Warden.*

### FIRES SET BY RAILROAD LOCOMOTIVES.

I am gratified to state that the annual reports of fire wardens show that fifteen less fires were caused by railroad locomotives in 1896 than in 1895. The number reported in 1896, as caused by railroad locomotives, was seventeen. The following circular was communicated to general managers of railroad companies on the 6th of April:

STATE OF MINNESOTA,  
OFFICE OF CHIEF FIRE WARDEN.  
ST. PAUL, MINN., April 6, 1896.

To the General Manager

.....Railroad Company,  
.....Minn.

SIR: In compliance with Section 12 of the Act of April 18, 1895, "for the preservation of forests" and for "the prevention and suppression of forest and prairie fires," the various railroad companies in this state caused "warning placards," furnished by the Forest Commissioner, to be posted last year, at their stations in the vicinity of forest and prairie grass lands. The placards so posted must have been read by a great number of people and the effect was doubtless very beneficial. This office acknowledges with thanks the promptitude and willing spirit of railroad companies in endeavoring to carry the law into effect. I send you to-day by.....express, a fresh package of.....warning placards, on cloth, with request that the same be posted in place of the old ones, one on the outside and one on the inside of every depot or chief station building along the lines of your road in this state, in the vicinity of forest and prairie lands. It was noticed last year that at a few stations placards were not carefully posted; also, that a few stations were omitted. I also send.....copies of the above mentioned Act requesting your particular attention to Section 12, the provisions of which should be impressed upon all employes of your company in the field.

Said Section 12 requires several things of railroad companies, among them the use of *efficient spark arresters* on all their engines. While it is understood that it is not practicable to have absolutely efficient spark arresters, it is believed that the degree of efficiency of any device depends upon the care with which it is maintained in good condition. The Chief of the Forestry Division of the U. S. Department of Agriculture, Washington, in his annual report for 1893 (Report of the Secretary of Agriculture, 1893, page 345), shows that in the government forests of Prussia, representing 60 per cent of the German forest area, during the ten years 1882-1891, there occurred 156 large fires—96 from negligence, 53 from ill-will, 3 from lightning, and only 4 from locomotives. During seven years out of ten there were no fires caused by locomotives. It should be explained, however, that a very important help there in preventing fires along the lines of railroads is a system of patrolling, also better organization than we have for controlling any such fire. How is it in regard to fires from locomotives in Minnesota? Not to mention the year 1894, there were in 1895, according to reports from fire wardens, thirty forest and prairie fires caused by sparks from railroad locomotives!

We are entering on the second year of this new law. The rains of last year produced rank vegetation in many places, and before December there will doubtless be dangerous weather for fires. It is expected that each railroad company will insist upon rigid and frequent inspections of the spark arresters, cause seasonable repairs to be made where needed, and hold locomotive engineers to stricter accountability for the good condition of their spark arresters. Whether it would not be economical to enlist the interest and service of inhabitants along the roads to watch and act as patrols and guards in dangerous weather to extinguish fires may be worthy of consideration.



Under the law, individuals are held to strict responsibility, and a marked decrease of the number of fires caused by locomotives will have a tendency to promote willing compliance with the law generally.

Very respectfully,

.....  
*Chief Fire Warden.*

Section 12 of the Forest Preservation Act requires railroad companies to use efficient spark arresters on all their engines and to keep their right of way to the width of fifty feet on each side of the center of the main track cleared of all combustible materials. Where engineers, conductors or trainmen discover that fences or other materials along the right of way, or wood land adjacent to the railroad, are burning, or are in danger from fire, they shall report the same promptly at the next telegraph station that they may pass. In seasons of drouth railroad companies shall give particular instructions to their employes for the prevention and prompt extinguishment of fires.

In the matter of keeping their right of way cleared of combustible materials and in the care used by section men in burning such materials, especially as to companies operating in forest regions, there is much room for improvement.

#### FOREST AND PRAIRIE FIRES 1896.

As herein before, stated very dry weather prevailed over a large area of forest country, and especially in the region of Lake Superior. In 21 counties the aggregate number of forest fires reported in 1896 was 91, and the number of acres burned over, mostly light timber and meadow, was 14,912. The aggregate amount of damage caused by these fires was \$16,059. The number of prairie fires was 103. The number of acres burned over was 199,325, and the aggregate amount of damage reported was \$21,788. The acreage swept by prairie fires was surprisingly large and occurred mostly in the valley of the Red River of the North. The area burnt over in Polk county alone was 45,000 acres. In deference to the opinion of local authorities

fire warden precautions were omitted in that large county except as to two or three towns. In the future these precautions should be required until the danger of such fires to any great extent shall cease. Also, in Marshall county large prairie fires occurred in towns where fire warden precautions, out of deference to local authority, were not taken. The aggregate figures were also largely swelled by the prairie fires which occurred in the new and thinly settled county of Roseau.

For any one to set fire that he cannot control in dry weather in the vicinity of forest is morally and legally wrong. It is not to be expected, however, that negligent and lawless people will change their habits all at once, but if the law is enforced with reasonable vigor they will from year to year become habituated to greater care.

From now on the number of new settlers going into our forest regions to open farms is likely to increase. The danger from fires will increase, and as fire warden service becomes extended over additional territory not heretofore heard from, the number of fires reported is liable for some years to increase. The important thing, however, will be to prevent any of them becoming very serious.

#### SUMMARY OF FOREST FIRES, 1896.

County and Towns.	Date.	Acres.	Damage.	Cause.
<b>Aitkin County—</b>				
Beaver .....	Sept. 28.....	*50	None	Clearing land.
Hazelton .....	Oct. 1.....	5	.....	Unknown.
Kimberly .....	Aug. 1.....	*15	\$40	Railroad locomotive.
Spencer.....	Sept. 23.....	*100	None	Unknown.
Unorg. T. 47, R. 24..	Sept. 30.....	60	15	Unknown.
<b>Becker County—</b>				
Clifford.....	Oct. 24.....	†800	.....	Unknown.
<b>Benton County—</b>				
Gilmanton.....	Oct. 22.....	*25	None	Unknown.
Gilmanton.....	Oct. 25.....	†5	None	Hunters.
Glendorado.....	Oct. 5.....	6	None	Hunters.
Granite Ledge.....	Oct. 25.....	25	None	Unknown.
Maywood.....	Aug. 30.....	100	200	Railroad section men.

County and Towns.	Date.	Acres.	Damage.	Cause.
<b>Carlton County—</b>				
Atkinson .....	Aug. 3.....	*5	None	Unknown.
Atkinson .....	Sept. 23.....	†160	60	Unknown.
Atkinson .....	Sept. 26.....	200	100	Unknown.
Atkinson .....	Sept. 27.....	160	68	Unknown.
Carlton.....	Sept. 23.....	100	None	Tramps.
Knife Falls.....	Sept. 24.....	200	50	Clearing land.
Knife Falls.....	Sept. 28.....	*100	50	Unknown.
Mahtowa .....	Sept. 28.....	500	3,000	Burning meadow.
Red Clover.....	Aug. 4.....	1	None	Lightning.
Red Clover.....	Sept. 23.....	2	None	Unknown.
Red Clover... ..	Oct. 3.....	2,000	1,000	Clearing land.
Split Rock.....	Aug. 19.....	†1	6	House chimney.
Split Rock.....	Sept. 9.....	†1	None	Clearing land.
Thomson .....	Sept. 22.....	†1,000	400	Railroad section men.
Twin Lakes.....	Sept. 26.....	1,500	5,000	Railroad locomotive.
<b>Cass County—</b>				
Unorg. T. 146, R. 27	May.....	80	None	Unknown.
<b>Cook County—</b>				
Unorg. T. 59, R. 4 W	July 23.....	25	100	Lightning.
Unorg. T. 60, R. 2 W	.....	2	.....	Campers.
<b>Crow Wing County—</b>				
Crow Wing.....	Sept. 29.....	15	50	Threshing engine.
Deerwood .....	Aug. 8.....	†180	75	Burning old hay.
St. Mathias.....	Oct. 1.....	†1,000	100	Unknown.
<b>Douglas County—</b>				
La Grand.....	Oct. 11.....	4	None	Unknown.
<b>Itasca County—</b>				
Iron Range .....	July.....	200	Slight	Clearing land.
<b>Kanabec County—</b>				
Arthur.....	Aug. 4.....	†6	None	Unknown.
Arthur.....	Aug. 27.....	†50	20	R. R. section men.
Arthur.....	Sept. 25.....	500	50	Unknown.
Brunswick .....	Aug. 22.....	†30	100	Unknown.
Brunswick.....	Sept. 1.....	†160	None	R. R. section men.
Brunswick.....	Oct. 16.....	†320	None	Railroad locomotive.
Fillman.....	July 15.....	½	None	Lightning.
Knife Lake.....	Oct. 24.....	*640	57	Unknown.
<b>Lake County—</b>				
Beaver Bay.....	Sept. 27.....	350	300	Clearing land.
Beaver Bay.....	Oct. 1.....	40	400	Travelers.
Beaver Bay.....	.....	20	100	.....
Two Harbors.....	Sept. 30.....	600	1,500	Unknown.
<b>Marshall County—</b>				
East Valley.....	Oct. 19.....	†80	20	Unknown.
<b>Mille Lacs County—</b>				
Bogus Brook .....	Sept. 28.....	†300	None	Unknown.
Milo.....	Aug. 23.....	40	None	Clearing land.
<b>Morrison County—</b>				
Cushing.....	Oct. 1.....	30	5	Unknown.
Ripley.....	Oct. 1.....	†300	200	Unknown.

County and Towns.	Date.	Acres.	Damage.	Cause.
<b>Otter Tail County—</b>				
Butler.....	Aug. 13.....	*40	None	Unknown.
Homestead.....	Aug. 24.....	5	.....	.....
Pine Lake.....	Oct. 15.....	†80	30	Railroad locomotive.
Woodside.....	Sept.....	40	.....	Unknown.
<b>Pine County—</b>				
Brook Park.....	Sept. 24. . .	*20	50	Railroad locomotive.
Dell Grove.....	Aug. 28.....	†20	None	R. R. section men.
Dell Grove.....	Aug. 29.....	5	None	Railroad locomotive.
Dell Grove.....	Sept. 2.....	10	.....	R. R. section men.
Dell Grove.....	Sept. 26.....	*3	10	Clearing land.
Dell Grove.....	Sept. 26.....	*4	None	Burning slough.
Finlayson.....	Aug. 28.....	30	100	Railroad locomotive.
Finlayson.....	Sept. 26.....	*80	50	Railroad locomotive.
Mission Creek.....	Aug. 15.....	40	15	Clearing land.
Pokegama.....	July 30.....	40	30	Unknown.
Rock Creek.....	Oct.....	80	100	.....
<b>Polk County—</b>				
Emardsville.....	Oct. 3.....	†6	5	Burning stubble.
<b>Roseau County—</b>				
Soler.....	Sept. 23.....	36	10	From town of Barto.
<b>St. Louis County—</b>				
Canosia.....	Sept. 25.....	4	None	Unknown.
Canosia.....	Sept. 27.....	2	None	Unknown.
Canosia.....	Sept. 28.....	2	None	Unknown.
Culver.....	Oct. 2. . .	2	None	Surveyors.
Duluth.....	Sept. 25.....	80	28	Hunters.
Duluth.....	Sept. 29.....	80	200	Unknown.
Gnesen.....	Sept. 24.....	100	None	Hunters.
Gnesen, T. 53, R. 14	Oct. 5.....	20	1,500	Hunters.
Herman.....	Sept. 20.....	†80	None	Hunters.
Herman.....	Sept. 28.....	†40	None	Hunters.
Herman.....	Sept. 30.....	15	None	Clearing land.
Industrial.....	Sept. 20.....	30	50	Hunters.
Industrial.....	Sept. 24.....	*200	130	.....
Industrial.....	Sept. 25.....	25	25	Clearing land.
Industrial.....	Sept. 25.....	100	300	Unknown.
Midway.....	Sept. 27.....	40	None	Unknown.
New Independence.	Oct. 1.....	80	100	Railroad locomotive.
Rice Lake.....	Sept. 25.....	10	100	Hunters.
Rice Lake.....	Sept. 28.....	500	None	Hunters.
Rice Lake.....	Oct. 5.....	150	150	From adjoining town.
Unorg. T. 54, R. 21..	Oct. 3.....	80	None	Clearing land.
<b>Todd County—</b>				
Wykeham.....	Oct. 4.....	†320	10	Hunters.
Wykeham.....	Oct. 25.....	†120	None	Smoker.
<b>Wadena County—</b>				
Shell River.....	Oct. 3.....	200	None	From adjoining town.

\* Meadow.      † Light timber.

Total acres burned over, 14,912.      Damage, \$16,059.

Classification of causes:

From clearing land, 12.

From railroad locomotives, 9.

From hunters and fishers, 11.

From other causes, 22.

Unknown, 33.

## REPORTS OF FIRE WARDENS OF FOREST FIRES IN 1896.

## AITKIN COUNTY.

Henry Lukala, chairman of the town of Beaver, October 14th:

A man had been burning brush on his clearing on Sec. 28, September 28th, and the weather being dry and wind high, it spread over 50 acres of swamp, but did no damage. It was soon put out by fire wardens and their helpers.

E. O. Brown, chairman of the town of Kimberly, August 26th:

A fire occurred the 1st instant, burning over 15 acres of hay field, destroying three stacks of hay. Damage, \$40 to \$50. It originated on Sec. 1 and was caused by sparks from a steam shovel engine. Was extinguished with assistance of railroad men. Weather dry and windy.

Charles Lovegren, of the town of Farm Island, September 1st:

It has been quite dry the last two months, but there is no danger as yet.

## BENTON COUNTY.

M. J. Lynch, chairman of the town of Glendorado, February 21st, 1897:

A fire occurred on Sec. 36, October 5th, and burned about six acres; no damage. I called out six men and extinguished it in two hours. It was set by hunters. There was a high wind, but the fire was in timber or we would not have been able to extinguish it.

## CARLTON COUNTY.

John Atkinson, chairman of the town of Atkinson, August 17th:

Fire occurred August 3, originating on Sec. 20, burnt over five acres small brush. No damage. The land adjoins a lake and I think it was started by fishermen. It was extinguished ten hours after it started by shoveling earth. Weather dry and windy.

Again, September 27th, he writes:

We have a fire which broke out on Sec. 35. Fires have broken out all around us in all directions. We are in bad shape. I have 21 men out fighting fire. Will report later, have not time now.

Also, October 1st, he reports:

We have got the fires in my district under control now. I counted 12 fires in the forest in Towns 47 and 48, Ranges 17 and 18.

October 16th he reports:

There was a fire September 23, originating on Sec. 35, Town 48, Range 18, which ran over 160 acres, destroying 11 tons of hay. Damage, \$60. It was extinguished by use of shovels, pails, wet sacks, two teams with plows and by backfiring. Weather dry and windy.

A fire occurred September 26, originating on Sec. 34, Town 48, Range 18, and burned over 200 acres of partly light and partly heavy timber. Damage, \$100. Weather dry and windy. It was extinguished by use of shovels, pails, wet sacks and by backfiring.

A fire occurred September 27, weather dry and windy, originating on Sec. 2, Town 47, Range 18, and burnt over 160 acres of light timber on Sec. 35 of this town. Destroyed 3 tons of hay, cord wood and timber. Extinguished by clearing, plowing, shoveling earth, using wet sacks and by backfiring.

Asa Paine, president village council of Carlton, October 5th:

A forest fire occurred in the east part of the town of Carlton September 23; burnt over 100 acres of light timber and destroyed nothing of value. It originated on land occupied by lumber yards and was caused by tramps "camping out." Twenty persons assisted in extinguishing it and it was finally extinguished by rains.

I note your remarks concerning plowing as a means of stopping and backfiring and as a firebreak. That is impracticable in this vicinity, as our lands are thickly covered with a young growth interspersed with old and down timber and a rank growth of grasses in some places.

The only successful mode is backfiring before the wind drives the fire onto the property to be saved, and the placing of men at frequent intervals with shovels to throw dirt on to the fire and keep it down. That is the means I have used except on the east side of our village, where it was convenient to a body of water and we could use steam fire pumps and hose.

The greatest suffering among the farmers is caused by the burning of the large amount of hay on the various meadows, and this is really working a great hardship to them and I wish there was some means of replacing this fodder, as many families will suffer from their inability to feed their live stock and especially their milch cows.

October 9th he reports:

There was a fire the 28th September which burnt over 100 acres of field and timber. Damage, \$50. A strong wind was blowing. It was put out in 36 hours after it started with the help of 8 men, including fire wardens.

Matt. Heikkila, chairman of the town of Red Clover, October 9th:

There was a fire September 23d, originating on Sec. 20, occupied by the Clinton Lumber Company, which burnt over two acres of old cut land; cause unknown. Was put out in two days after it started by ditching around the fire. Weather dry and windy.

On the 3d instant a fire, caused by clearing land on Sec. 10, ran over about 2,000 acres of light timber and cut land, doing damage, according to my estimate, of \$1,000. It is difficult to estimate the damage. Some claim that a fire does benefit rather than damage. The way I estimate is this: If timber that is burned over could be cut this winter and used for what it is fit for the damage would not be much over the above mentioned amount, otherwise it would be a great deal more. The fire had started many days before I was informed of it. It was extinguished by ditching around the more dangerous parts. The weather was dry and windy at first, but there was rain on the 4th.

Nels Johnson, of the town of Thomson, November 16th:

A forest fire occurred Sept. 22 in the north part of the town of Thomson, being Township 49, Range 16, caused by section men of Duluth & Winnipeg Railroad Company burning right of way. It burnt over 1,000 acres of brush timber and destroyed fences and timber. Damage, \$400. It was extinguished in 60 hours after it started, by fire wardens and help which we called, by backfiring, ditching and throwing on water. The weather was dry and windy.

William Sheils, chairman of the town of Twin Lakes, October 4th:

There was a fire September 26, originating on Secs. 27 and 30, Township 48, Range 16, along the N. P. R. R. It burnt over 1,500 acres of all kinds of hard timber, destroying timber, hay, wood and fences and doing damage to the amount of \$5,000. Weather was dry and warm with high winds. Seventy-five persons were called to help extinguish it, which was done in six days after it started by plowing, backfiring, digging, etc. I. F. Jagger, Frank Kelly and Fred Haubagger, all of Wrenshall, rendered particularly praiseworthy service.

The fires are pretty well under control here now, but if we do not get rain and the wind keeps blowing I am afraid we will have more fires yet. I cannot say much until I get time to look around and inquire into the matter, as I have not had my clothes off for a week.

Same, November 21st:

Parties living in the vicinity say it was a crew clearing right of way on the N. P. R. R. that set the fire. I was busy starting camp at time of fire. As soon as we got it under control I could not give it any more attention.

#### COOK COUNTY.

J. E. Johnson, of unorganized Town 61, Range 4, December 18th:

There was a fire on Sec. 11, Township 61-4, October 7, burnt over one acre of light timber and did damage to amount of \$10. Must have been caused by hunters. It was extinguished in nine hours after it started by carrying water and by shoveling earth upon it. Weather very dry with some wind.

#### CROW WING COUNTY.

O. Vanasse, of town of Crow Wing, November 17th:

There was a fire on Sec. 19, August 9th, which burnt half an acre of meadow. A party was building a road and set fire to burn a wasp's nest. He went home and did not come back for a week. A few days after the fire started to run. With the help of one person, whom I called, I dug a ditch around the fire; then I notified the party who set it and it was extinguished. The weather was very dry.

There was a fire September 29 on the west side of the town of Long Lake which burnt over 15 acres of meadow, destroyed the grass and sod; damage, \$50. A threshing engine came over this meadow, which is crossed by a town road, and set fire to the sod in the road. The weather was exceedingly dry; we had had no rain for a month and there was a heavy wind. The only thing we could do was to keep it from flying across the road. I hauled water in barrels and kept the same at hand, and kept the fire from running on high land and from running across the road into my town. It was extinguished in twenty days by a heavy rain.

John Brand of the town of Deerwood, October 17th:

On the 8th of August there was a fire which originated on Sec. 4 from burning old hay, the weather being windy, burnt over 180 acres of light timber and some pine. Damage, \$75. It was extinguished 27 hours after it started by digging up the earth around it. On one side was a lake.

Charles P. Ainsworth, of the town of St. Mathias, October 4th:

A forest fire occurred in the southeast part of this town the 1st instant, ran over about 1,000 acres of brush and meadow, and destroyed a little spruce and tamarack timber. The number of persons assisting in extinguishing the fire was 23. It was extinguished by backfiring along the road. The weather was very dry. Raining to-day.

#### HUBBARD COUNTY.

Frank Judnitch, of the town of Arago, November 2d:

The weather was dry in September and October. Very lucky this season in having no fires.

Dewitt Clason, of Osage, Feb. 11, 1897:

I know from personal knowledge that the Indians are responsible for a good many forest fires. I have known several instances where they have set fires in lonely places in woods so that grass would come up to attract deer, that they could more easily kill. I have also heard them remark that as long as there was timber on the reservation they would see that there was dead and down timber for lumbering. The Indians cause fires that are sometimes charged to cruisers.

#### KANABEC COUNTY.

C. P. Larson, chairman of the town of Arthur, October 9th:

A forest fire occurred September 24th and 25th which burnt over 500 acres of brush and timber and destroyed pine timber. Damage, \$50. Cause unknown. There was a heavy wind from the southwest. It was extinguished by digging firebreaks and backfiring.

L. A. Larson, of the town of Arthur, October 10th:

A fire occurred August 28 which burned over 50 acres of brush and meadow caused by section men burning right of way. Damage, \$20. It was extinguished in two days after it started.

L. I. Renstrom, of the town of Arthur, October 29th:

There was a forest fire August 4th, originating on Sec. 34, and burnt over 6 acres of brush. There was quite a hard south wind. It was extinguished in 17 hours after it started, by firebreaks and water.

Also, on September 2, there was a fire on Sec. 27, which burned over 6 acres of brush. Hard south wind at the time. It was put out in three hours with water.

C. H. Olson, chairman of the town of Brunswick, September 4th:

There was a fire in the northwest part of the town September 1st, caused by railroad men, which burnt over 160 acres of brush and meadow. The fire



started at the railroad and ran in a southerly direction. It was extinguished in 24 hours. Half an hour after I got there a slight rain fell, so we got around it. Five persons were called to help.

Same, October 30th:

There was a fire October 16, caused by railroad employes, which burnt over 320 acres of brush and meadow, weather being dry. It was put out in 24 hours after it started by backfiring.

C. H. Ramgren, of the town of Brunswick, December 29th:

On the 22d August a fire burnt over 30 acres of meadow and light timber in Sec. 13; damage, \$100; caused by burning a hornet's nest. The weather was very dry, with strong wind. The number of persons called to extinguish the fire was 22. A strip was cleared off and plowed in the hard land. On the meadow digging was done a distance of about 80 rods so as to confine the fire. It was extinguished in three days after it started.

From Hon. Charles Keith, dated Mora, September 1st:

From to-day's train I notice at some distance from the railroad large fires burning in the timber. Very soon a large destructive fire will be laid at the door of the Great Northern Railway, which they have not occasioned. This fire is now opposite the 44th mile post on the St. Cloud and Hinckley line, and coming up from the south toward the tracks.

W. F. Hillman, chairman of the town of Hillman, December 5th:

The 15th of July, weather hot and dry; the lightning struck two trees on Sec. 31, burning them down and setting the woods on fire. I extinguished the fire myself by digging around it. Distance from my place three and a half miles.

E. O. Mellgren, of the town of Knife Lake, November 6th:

A fire occurred October 24th, which burnt over 640 acres of meadow. Cannot state for certain how it originated. Heavy wind from southwest. Fourteen persons were called to help extinguish it, which was done by firebreaks in ten hours after it started.

#### LAKE COUNTY.

W. D. Lawrence, chairman of the town of Two Horbors, October 7th:

A fire which started on Sec. 24, Township 53, Range 11, in the morning and continued all day, burnt over 600 acres of cut and standing pine land. Ten persons were called to help extinguish it, which was done by fighting with earth and backfiring to prevent it running further. Cause unknown. Weather very dry. Recent rain completely extinguished it.

R. H. Slater, chairman of the town of Beaver Bay, December 24th:

On the 27th September a fire, caused by clearing land in the northwest part of Township 55, Range 8, burnt over 350 acres of brush land and destroyed 80 feet span of bridge, damage \$300, but no damage to the land. Eight persons helped to extinguish it by digging trenches and carrying water. Weather very dry and strong winds. The weather was so dry it was impossible to put the fire out entirely. It burnt about a week. Heavy rain helped to put it out. The ground is covered with moss and old rotten wood a foot or more.

Same, Feb. 11, 1897.

There was a fire in Secs. 34 and 35, Town 56, Range 8, which burnt over 20 acres. Damage, \$100. Cause unknown.

Jacob Hangartner, of the town of Beaver Bay, December 22d:

A fire in the west part of Township 56, Range 7, caused by travelers on the highway, burnt over 40 acres of light pine timber. Damage, \$400. It was put out in 40 hours after it started, by cutting around the timber. Weather was very dry.

#### MILLE LACS COUNTY.

Frank Kaufert, of the town of Bogus Brook, October 10th:

On the 28th September a fire, which originated on Sec. 29, burnt over 300 acres of brush and light timber and was put out in four and a half days after it started, by use of wet sacks and otherwise applying water. The weather was dry and windy.

Lester Kempton, of the town of Milo, September 12th:

August 23 a fire burnt over 40 acres of dead timber on Sec. 22, and was under control in two days after it started. It was caused by burning brush. Weather hot with high wind from the south. It was extinguished by plowing up an old road about 80 rods and backfiring; by keeping it from crossing and going north; and by keeping it below Rum river, a mown meadow and two roads.

#### MORRISON COUNTY.

Phillip Moran, of the town of Ripley, October 5th:

The 1st instant a fire burnt over 300 acres of light timber brush and meadow in the east part of the town and destroyed twenty-five tons of hay. It was extinguished with wet rags tied to pitchforks dipped in water, which was hauled in barrels by teams. It has been raining all night, so there is now no more danger.

#### OTTERTAIL COUNTY.

Joseph Daiker, of the town of Pine Lake, October 3d:

On the 1st instant a fire, which originated on Sec. 22, set, as supposed, by a passing threshing engine, burned over ten acres of poplar brush; was extinguished in seven hours after it started by throwing earth upon it and by digging trenches. Weather was dry with little wind.

Same, October 16th:

The 15th instant a fire on Sec. 29, supposed to have been set by sparks from a railroad locomotive, burnt over 80 acres of poplar brush. Damage, \$30. It was extinguished in five hours after it started.

M. H. Wood, chairman of the town of Woodside, Feb. 23, 1897:

A small fire occurred in the month of September which burnt over about 40 acres and destroyed seven tons of hay. Damage promptly settled by party who let the fire get away.

## PINE COUNTY.

N. F. Alderman, of the town of Brook Park, September 24th:

A fire on this date, set by a freight train locomotive, burnt over twenty acres of mostly meadow and destroyed nine tons of hay and five rods of corduroy road; damage, \$50. Twenty-one persons assisted in extinguishing it, which was done by plowing, using wet sacks and hauling water. Weather dry and very windy. Hulda Johnson discovered the fire and ran over a mile to call help.

Erick Troolin, chairman of the town of Dell Grove, August 28th (telegram):

Swamps along the St. Paul and Duluth railroad are afire, set by section men. Please advise me.

Same, September 3d:

A fire set on the 28th August by section men of the St. P. & D. R. R. Co. burnt 20 acres of swamp.

On August 29 a fire, set by the locomotive of passenger train going south on Sec. 6, burnt over five acres and was put out in ten hours after it started.

Same, Feb. 20, 1897:

A fire was set in a swamp September 2 by a railroad locomotive on Sec. 36, Town 42, Range 21. Burned over about ten acres and was watched to prevent its spreading.

Severt Haglen, of the town of Dell Grove, September 28th:

On the 26th instant a fire set on Sec. 7 burnt over 4 acres of marshy meadow. Origin not known, but it looks as if it was started to burn the swamp out. It was subdued by brush brooms and shovels. Weather hot and dry, blowing from the northwest. The fire is not yet out and a shift of wind may set it running again and cause a very big fire if it continues dry; in fact there are a great many fires in sight all around this neighborhood. One on Sec. 6 was caused by clearing land in adjoining town.

J. F. Wilkin, chairman of the town of Finlayson, September 5th:

On the 28th August a fire on Sec. 17, Township 43, Range 20, set by sparks from a locomotive of the St. Paul & Duluth Railway Co., burnt over 30 acres and destroyed ten acres of timber, the balance brush; damage, \$100. It was extinguished in 36 hours after it started by mowing the brush and weeds, beating it with wet sacks, also plowing and digging with shovels where it was possible to smother it. Weather very dry. This is only one of a number of fires the past month caused by sparks from the St. P. & D. R. R. engines. Mr. Kelly, roadmaster, has always responded to a message with a crew of men in very short time, taking the nearest engine to dispatch the crew.

Same, September 30th:

On the 20th instant a fire on Sec. 19, set in the afternoon by sparks from a St. P. & D. R. R. engine, burnt over 80 acres of field and meadow and destroyed hay and corn of the value of \$50. It was extinguished in 6 hours after it started with buckets, sacks and backfiring.

John Falde, chairman of the town of Mission Creek, August 30th:

We have a fire covering about an acre of swamp. The turf or vegetable matter seems to be burning and I am unable to extinguish it. We are therefore digging ditches around the whole piece and will, I hope, in this way prevent it from spreading. The cause of the fire is no doubt hunters. No damage done.

John E. Norstrom, chairman of the town of Pokegama, Feb. 23, 1897:

In the latter part of July last a fire on Sec. 15, Town 39, Range 22, burnt over about 40 acres, destroying five stacks of hay. Damage about \$30. It was promptly extinguished, otherwise it would have spread all over the country west of Pokegama lake by reason of the abundance of grass and inflammable material in swamps and old pine choppings.

Geo. L. Stevens, chairman of the town of Rock Creek, February 6th:

There was a fire which started on Sec. 35, October 27, and burned about 80 acres. I went one day and looked the matter up, but could not get any proof as to who set it and so I had to drop it.

#### ST. LOUIS COUNTY.

E. B. Engren, chairman of the town of Canosia, September 29th:

A fire occurred the 25th instant, from cause unknown, and burnt over 4 acres. It was extinguished with mud and water taken from ditches by the road crew. No damage. Weather was windy.

Also, on the 27th instant a fire, from cause unknown, burnt over 2 acres on Sec. 31, being vacant land, and was put out, as supposed, in 12 hours with water which had to be hauled. Weather was windy and there was much dry rubbish on the ground.

Same, October 5th:

A fire broke out Sept. 29 which must have originated from the one of Sept. 27, but it only burnt over an acre of light timber, doing no damage. I had two men watch it Sept. 30 and the 1st, 2d, 3d and 4th instant and with water put out all the places it burnt in the ground and under roots.

Aug. Boquist, of the town of Canosia, October 27th:

A fire Sept. 28 burnt over 2 acres on Sec. 34. It was put out by throwing earth upon it. No damage.

Jules Coulombe, chairman of the town of Culver, November 30th:

On the 1st of October a field fire occurred on Sec. 12 which burnt over 5 acres. No damage. Cause unknown. Four persons were called and helped to extinguish it with water. Weather windy.

On the 2d October a fire on Sec. 3, set by a surveying party, burnt over 2 acres of brush and light timber. No damage. It was put out in 5 hours with the help of three persons by ditching. Weather windy.

Henry Kirk, of the town of Duluth, October 1st:

I resigned my office as chairman Sept. 7th and D. J. McDowell is appointed in my place. Up to September 7th there were no fires in this town, but there are some very bad forest fires now, which have all started in the last 12 days.

D. J. McDowell, chairman of the town of Duluth, December 28th:

A fire on Sec. 5 in September, supposed to have been caused by hunters, burned over 80 acres and destroyed hay of the value of \$28. The timber on the land had been cut, and what was left was light and no good.

Alfred Swanson, of the town of Duluth, December 9th:

A fire occurred on Secs. 17 and 27 (Town 52, Range 12) September 29 and 30 and October 1st and 2d, which burnt over 80 acres of heavy timber. Damage, \$200. It was extinguished by digging and by cutting trees.

C. M. Stevens, of Floodwood, October 6th:

The fire in Sec. 34, Town 54, Range 21, burned over 80 acres of old chopping and swamp, and was caused by burning brush to clear land. It was extinguished by brushing it out. I did not wait for an answer from you on Saturday, but I did not find the fire as bad as reported. It had burned across an old chopping and a swamp, but when it came to the high ground it did not run and there were two men at work putting it out when I got there. No damage was done. I staid till Sunday noon and it was nearly all out, and it commenced raining and rained all the afternoon and night Sunday, so there is no danger of fire here for some time.

Martin Lepak, chairman of the town of Gnesen, November 20th:

The 24th September a fire on old timber cutting in Sec. 10 (Town 52, Range 14) burnt over 100 acres but did no damage. It is supposed to have been caused by a hunting party. With reference to the fire in the western part of Town 53, Range 14, I learned from inquiry that it caused no damage of consequence. It was across the Cloquet river and almost inaccessible for me, as there is no way of crossing the river except by boat, and I had none at my command. It is very difficult to secure reliable information as to the cause of a forest fire.

Peter Fishan, chairman of the town of Herman, October 9th:

On the 30th September a fire in the center of the town burnt over about 15 acres of meadow and brush and destroyed some dry pine trees. No damage. It was caused by clearing land. Earth was thrown on it to prevent its spreading. Weather dry and windy. On the 4th we had a good rain and all danger of fire is over for awhile.

Rudolph Lang, of the town of Herman, October 6th:

On the 20th September a fire on Sec. 18, caused, I think, by hunters, burned over 80 acres of brush, but did no damage.

James Erikson, chairman of the town of Industrial, October 27th:

A fire on Sec. 6 September 20 burned over 30 acres of brush and timber and destroyed standing timber and cordwood of the value of \$50. Supposed to have been caused by hunters. It was put out in two weeks by shoveling earth, using water and grubbing ditches. Weather very dry with high wind.

On the 25th of September a fire on Secs. 3 and 10 burned over 25 acres of light timber and destroyed 10,000 feet of white pine; damage, \$25. It was caused by a gang of road laborers and was extinguished with water, by shoveling earth and digging ditches. Weather very dry and windy.

H. Longtin, of the town of Industrial, September 27th:

A fire on the 25th instant, originating on Sec. 34, burnt over two miles of old chopping and meadow and destroyed hay and pine of the value of \$300. It is not known how it originated. It is still burning, but I think the danger is over. Weather very dry.

Herman Hanson, of the town of Industrial, October 4th:

On the 24th September a fire, which originated at 11 A. M. on Sec. 34, burnt over 200 acres of meadow and light timber, and destroyed 13 tons of hay. Damage, \$130. The weather was very dry and windy and the fire could not be put out until rain came to-day. Sixteen persons were employed by me in holding fires from property and homes of settlers and from additional hay and meadows.

Same, October 20th and November 23d:

I know nothing of details of fire reported by H. Longtin, except that I know he and others were fighting a fire in his district while I was taking care of the one I reported. While on same section the two fires were far apart and were on opposite sides of the Duluth, Missabe & Northern railroad tracks. Mine was started in some way on the east side of the R. R. in a heavy meadow and burned through the meadow and off north.

I went through the district afterwards to look over pine and found it O. K. except a few dry pine. Some of the men employed by me to help on fires live ten to fifteen miles away and cannot very well get around to swear in their time, etc. Is it necessary for each man to swear to his own time in order to get his pay for fire protection work, or can I, who employed them and kept time, swear to it instead?

E. J. Berneche, citizen of Burnett, in the town of Industrial, Jan. 4, 1897:

On September 28 last at noon a train north bound, engine No. 5, caboose 14, set fire on my premises and before the train had entirely passed the spot the flames were seen shooting up skyward. It was but a short time till the woods and meadow across the track were all on fire. You no doubt have had a report of this fire from Mr. Hanson, fire warden here. In this fire the writer lost a small stack of hay, about three tons.

Olaf Gulbrandson, chairman of the town of Midway, November 9th:

A fire Sept. 27 on Sec. 18, which originated from an old fire, burnt over 40 acres of brush. No damage. Hard wind blowing. The fire was attended by C. Walin, fire warden for district No. 2 of said town. I think there should be a law that would compel the man that set a fire to work without pay.

G. A. Ringquist, of the town of New Independence, October 5th:

On the 1st instant a fire on Sec. 6, set by a railroad locomotive, burned over 80 acres of timber; damage, \$100. It was extinguished in 18 hours after it started by throwing earth upon it. Weather dry and windy.

James Campbell, chairman of the town of Rice Lake, October 5th:

On September 28 a fire originated, from hunters as supposed, on Secs. 35 and 36, which burnt over 500 acres of mostly hard wood, the pine having been cut two years ago. I do not think it destroyed any timber. Eight persons were called to help extinguish it. Where we could get water we stopped the fire from running, but where we could not get water we shoveled earth upon it, which checked it nearly as well as the water. Weather very dry, but the wind did not blow hard. One thing that was in our favor, there was quite a lot of branch logging roads which gave a clear place to work in. We did not get the fire all out, but kept it pretty well under control, until Sunday afternoon we got a good shower of rain and that fixed it.

A. A. Miller, of the town of Rice Lake, November 9th:

On the 25th of September a fire on Sec. 18, which was caused by the carelessness of hunters, burned over 10 acres of heavy timber and destroyed 50 cords of wood. Damage, \$100. It was extinguished in six days by flooding it with water. Weather warm and dry. The three persons called upon were prompt in coming.

J. F. Hobbes, of Duluth, fire warden for unorganized territory, October 13th:

On the 5th instant a fire on Sec. 35, Township 53, Range 14, burnt over 20 acres and destroyed about 400,000 feet of white pine and did damage to the amount of \$1,500. The land is owned by T. E. Dorr, of Saginaw, and is unoccupied. It probably was caused by camp fires built by hunters and carelessly allowed to spread. The fire was extinguished by rain on the 7th instant. Fire has also done considerable damage to standing pine along the line of the Duluth & Iron Range railroad; there have also been small fires in almost every township along the Cloquet river from the D. & I. R. railroad west. The fires, however, have not run to any extent and in the aggregate the amount of timber loss from fires in 1896 in St. Louis county will be much below the average. Rain during the first ten days of October extinguished all forest fires existing at that time and practically places the forests out of danger for the rest of the season.

#### TODD COUNTY.

John W. Sarff, of the town of Wykeham, October 21st:

On the 4th instant a fire on Sec. 16, caused, as supposed, by bee hunters, burnt over 320 acres and destroyed some small tamarack; damage, \$10. Land is owned by the state. It was extinguished in 5 hours. As the wind blew strong we thought it best to hire two watchers for the night, one on each road, as there were old stumps and logs on fire close to the road. It rained the next morning.

Same, October 26th:

On the 25th instant a fire on Sec. 15, caused by a man lighting his pipe, burnt over 120 acres of meadow, wire grass and light timber; destroyed nothing to speak of. About 20 to 25 persons assisted in putting it out, which was done by backfiring and public roads. Weather warm with a little wind.

## WADENA COUNTY.

Jerome Burt, chairman of the town of Shell River, October 12th:

On the 3d instant a fire burnt over 200 acres of meadow, but did no damage. It came from the town south of this (town of Meadow), where it burnt a great many tons of hay. Mr. Norstrum and two little boys kept the fire from crossing into a north slough, and it ran into a swamp and went out itself. The weather was dry and hot.

## SUMMARY OF PRAIRIE FIRES, 1896.

County and Towns.	Date.	Acres.	Damage.	Cause.
Big Stone County—				
Browns Valley.....	Oct. 14.....	*60	\$60	Burning straw.
Otrej.....	Oct. 18.....	*250	250	Burning straw.
Chippewa County—				
Granite Falls.....	Oct.....	*15	200	Burning stubble.
Leenthrop.....	Oct. 2.....	500	325	Burning straw.
Clay County—				
Elmwood.....	Sept. 17.....	*3	30	Burning straw.
Flowing.....	Sept. 23.....	280	75	Railroad section men.
Hawley.....	Oct. 13.....	20	12	Unknown.
Hawley.....	Oct. 13.....	100	.....	Burning straw.
Skree.....	April 20.....	2,500	.....	Unknown.
Jackson County—				
La Crosse.....	Sept. 20.....	*7	30	Burning straw.
Round Lake.....	Oct.....	5	None	.....
Kandiyohi County—				
Roseville.....	Aug. ....	*5	30	Railroad locomotive.
Kittson County—				
Clow.....	Oct. 14.....	3,000	None	Unknown.
Davis.....	Oct. 10.....	200	5	Burning straw.
Deerwood.....	Aug. 30.....	80	None	Unknown.
Deerwood.....	Oct. 14.....	3,500	15	Unknown.
Deerwood.....	Oct. 15.....	160	None	Unknown.
Hallock.....	Oct. 15.....	1,900	None	Unknown.
Hallock.....	Oct. 21.....	2,000	None	Unknown.
Hazelton.....	Oct. 14.....	3,800	150	Unknown.
Jupiter.....	Oct. 14.....	9,500	1,200	Unknown.
Richardville.....	Oct. 4.....	640	40	Burning firebreak.
Skane.....	Oct. 3.....	*40	75	Burning stubble.
Skane.....	Oct. 15.....	1,400	43	Unknown.
Svea.....	Sept. 27.....	7,000	200	Tramps.
Svea.....	Oct. 15.....	4,000	100	Burning firebreak.
Tegner.....	Oct. 20.....	800	None	Hunters.
Tegner.....	Oct. 22.....	500	None	Railroad locomotive.
Unorg. T. 160, R. 46	Sept. 29.....	80	.....	Unknown.
Unorg. T. 160, R. 46	Oct. 13.....	3,200	660	Unknown.
Unorg. T. 160, R. 46	Oct. 14.....	5,000	.....	Unknown.
Lac qui Parle C'ty—				
Arena.....	Oct. 28.....	*6	315	Burning straw.
Lake Shore.....	Oct. 15.....	50	60	Threshing engine.

\*Field or Meadow.



## ANNUAL REPORT OF

County and Towns.	Date.	Acres.	Damage.	Cause.
<b>Lincoln County—</b>				
Alta Vista.....	Oct. 23.....	320	80	Burning stubble.
Ash Lake.....	May 10.....	320	10	Unknown.
Diamond Lake .....	Aug. 25.....	30	None	Unknown.
Hansonville.....	Aug. 13.....	*	260	Lightning.
Hendricks.....	Oct. 21.....	640	20	Burning stubble.
<b>Lyon County—</b>				
Lake Marshall.....	.....	320	10	Unknown.
<b>Marshall County—</b>				
Bloomer.....	Sept. 1.....	320	350	Unknown.
Comstock .....	Sept. ....	2,500	.....	From town south.
Donnelly.....	Oct. 15.....	11,000	None	Unknown.
Holt.....	Sept. 30.....	800	None	From adjoining town.
Nilson Park.....	Oct. 14.....	300	40	From adjoining town.
Spruce Valley.....	Oct. 15.....	1,000	30	Unknown.
West Valley.....	Oct. 24.....	7	10	Unknown.
<b>Murray County—</b>				
Ellsborough.....	Oct. 22.....	80	None	.....
Holly.....	Sept. 27.....	640	230	Unknown.
Iona.....	Sept. 28.....	50	90	Hunters.
<b>Nobles County—</b>				
Elk.....	May 2.....	40	.....	Unknown.
<b>Norman County —</b>				
Waukan .....	Oct. 26.....	600	30	From Indian reservation.
<b>Pipestone County—</b>				
Grange .....	Aug. 30.....	*25	100	Railroad locomotive.
<b>Polk County—</b>				
Badger.....	Oct. 15.....	1,000	.....	From t'wn of Grove Park
Belgium.....	Sept. 23.....	2,000	.....	Hunters.
Bray .....	Sept. 27.....	200	None	Hunters.
Chester.....	Sept. 24.....	6,000	200	Unknown.
Euclid.....	Oct. 7.....	*2	4	Burning straw.
Farley.....	Oct. 20.....	20	50	Burning straw.
Grove Park.....	Oct. ....	500	40	From adjoining town.
Hammond.....	Oct. 19.....	2,000	300	Burning firebreak.
Lake Pleasant .....	Oct. 25.....	50	100	Railroad locomotive.
Numedal T. 154 R. 45	Sept. 24.....	16,000	8,000	Burning grass.
Numedal.....	Oct. 17.....	2,000	900	Burning grass.
Norden .....	Oct. 25.....	200	None	Unknown.
Parnell.....	Oct. 22.....	1,000	None	.....
Polk Centre .....	Sept. 23.....	500	50	Burning weeds.
Poplar River.....	Sept. 12.....	1,000	50	Unknown.
Russia.....	Oct. 19.....	700	None	Unknown.
Russia.....	Oct. 24.....	3,200	None	Unknown.
Skandia .....	Oct. 25.....	300	None	Unknown.
Tilden .....	Oct. 26.....	300	500	Hunters.
Vineland.....	Oct. 27.....	10,000	.....	Unknown.
<b>Pope County—</b>				
Hoff .....	Oct. 8.....	*2½	225	Railroad locomotive.
<b>Redwood County—</b>				
New Avon.....	Oct. 15.....	200	75	Unknown.
Sundown.....	Sept. 15.....	*20	60	Burning stubble.
Vail.....	Oct. 6.....	5	None	Threshers.

County and Towns.	Date.	Acres.	Damage.	Cause.
<b>Renville County—</b>				
Osceola.....	Sept. 14....	30	60	Unknown.
Wellington.....	Sept. 3.....	40	90	Burning stubble.
<b>Roseau County—</b>				
Barto.....	Sept. 23....	19,000	1,000	Unknown.
Dieter.....	Oct. 25....	700	150	Unknown.
Malung.....	Oct. 14....	800	40	Unknown.
Pohlitz.....	Sept. 22....	2,600	80	Unknown.
Soler.....	Sept. 23....	19,000	1,000	From adjoining town.
Spruce.....	Oct. 14....	60	6	Unknown.
Spruce.....	Oct. 24....	300	60	Unknown.
Spruce.....	Oct. 25....	3,500	.....	Hunters.
Stafford.....	Oct. 15....	3,000	28	Unknown.
<b>Stevens County—</b>				
Hodges.....	Sept. 3.....	*3	15	Railroad locomotive.
Hodges.....	Sept. 23....	60	None	Railroad locomotive.
Pepperton.....	Oct. 8.....	320	None	Threshing engine.
Pepperton.....	Oct. 16....	340	250	Burning stubble.
Synnes.....	Oct. 12....	300	None	Unknown.
<b>Swift County—</b>				
Camp Lake.....	Oct. 14....	80	20	Burning stubble.
Tara.....	Oct. 1.....	300	105	Burning stubble.
Torning.....	Sept. 25....	50	25	Burning straw.
<b>Traverse County—</b>				
Taylor.....	Sept. 22....	80	None	Burning stubble.
<b>Wilkin County—</b>				
Akron.....	Sept. 20....	5,700	None	Unknown.
Andreas.....	Sept. 22....	2,400	None	Hunters.
Brandrup.....	Sept. 27....	*20	35	Burning straw.
Manston.....	Oct. 28....	1,500	None	Unknown.
Mitchell.....	Oct. 7.....	1,500	None	Unknown.
<b>Yellow Med. C'ty—</b>				
Florida.....	Aug. 29....	600	285	Railroad locomotive.
Hazel Run.....	Oct. 3.....	250	None	Burning firebreak.

\* Field or meadow.

Total acres burned over, 199,325. Damage, \$21,788.

Classification of causes:

Railroad locomotives, 8.

Burning straw, 12.

Burning stubble, 9.

Hunters, 7.

Threshing engines, 2.

Other causes, 18.

Unknown, 41.

## REPORTS OF FIRE WARDENS OF PRAIRIE FIRES IN 1896.

## BIGSTONE COUNTY.

Michael Kennelly, of town of Brown's Valley:

A prairie fire occurred in the south part of the town of Brown's Valley, October 14, which burnt over sixty acres, destroyed twenty tons of hay and did damage to the amount of \$60. It originated on Sec. 34, and was caused by the carelessness of a hired man, who set fire to straw without plowing a firebreak. Weather was dry and windy. The fire was extinguished by plowing and by beating it out with wet sacks. I started out with team and plow, and neighbors who saw the fire came as quickly as possible. It did not get off the farm on which it started and was extinguished in two hours from the time it started.

Lorentz Larson, of the town of Otrej:

There was a prairie and field fire October 18, originating on Sec. 27, by burning straw without sufficient firebreak, destroying fifty tons of hay and two acres of medium timber. Damage, \$200. Extinguished with water and by plowing. Southwest wind blowing.

## CHIPPEWA COUNTY.

Andrew Rognstad, chairman of the town of Granite Falls, November 24th:

A fire, in October, which originated by setting fire to stubble on Sec. 15, burnt over 15 acres of field, destroying a granary and one rick of hay. Damage, \$200. It was extinguished in two hours after it started with help of five men plowing. There was a high wind.

A. B. Peterson, of the town of Leenthrop, November 25th:

A field and prairie fire occurred October 2d, which burned over 500 acres of meadow and field and destroyed one stack of wheat and four stacks and 75 tons of hay. Damage, \$325. It was caused by burning straw. There was a strong southwest wind. It was put out by farmers living close by, with teams and plows, and controlling it within public road.

## CLAY COUNTY.

B. F. Baumgardner, of the town of Barnesville, October 10th:

On the 1st instant one fire which originated on Sec. 16, from a railroad locomotive, burned over 1,600 acres, and destroyed hay of the value of \$160. It was extinguished in ten hours after it started.

M. Mallinger, chairman of the town of Elmwood, October 27th:

A fire occurred September 17, which burnt over three acres, destroying thirteen rods of willow hedge 25 feet high. Damage, \$30. It was caused by burning a straw stack, weather being dry and windy, and was put out two hours after it started, with use of water and wet sacks.

Christ Johnson, of the town of Flowing, September 24th:

A prairie fire occurred yesterday which burnt over 280 acres and destroyed two stacks of hay, doing damage to the amount of \$75. It originated on Sec.

31, and was caused by section foreman burning right of way. Weather windy. It was extinguished in six hours after it started by plowing and using wet bags. Andrew Hattledal, one of the town board, was present and assisted in extinguishing the fire.

George Kieping, of the town of Hawley, October 20th:

There was a fire about 11 A. M. the 13th instant, originating on Sec. 23, and burnt over 100 acres of prairie and river bottom. It was caused by a farmer setting fire to straw not having sufficient furrows plowed around it and the wind carried it away over the furrows. The weather was very dry and a south wind blowing at the time. I was on my way to a meeting of the town board, and seeing the fire was making so much headway, stopped and superintended putting it out, which was done about three hours after it started, by plowing and setting backfire.

Christopher Eid, of the town of Skree, November 9th:

On the 20th of April, the weather being dry and wind blowing from northwest, a fire came into this town from adjoining town on the west and burnt over 2,500 acres of prairie. It was put out in six hours after it started, with wet sacks.

#### JACKSON COUNTY.

J. B. Haberman, of the town of Lacross, November 27th:

There was a field fire September 22d, which burnt over seven acres of meadow, destroying fifteen tons of hay of the value of \$30. It was started by burning straw on plowed land on Sec. 19, and the heavy wind blew some of the burning straw on to the grass meadow. It was put out by plowing a firebreak and beating it out with brooms.

#### KANDIYOHI COUNTY.

A. J. Smithson, of the town of Roseville, November 19th:

A field fire in August, on Sec. 28, caused by a locomotive, burnt over five acres of wheat in shock. Damage, \$30. Weather dry. Almost all the fires in this section of the state are set by locomotives. About the middle and latter part of harvest we generally have excessive droughts.

#### KITTSO COUNTY.

R. Sylvester, of the town of Clow, November 7th:

On the 14th of October, weather being very dry, a prairie fire, which originated on Sec. 29 (Town 163, Range 49), burnt over 3,000 acres. We let it burn and protected ourselves. No damage. This fire was going for days.

Tollef Skatrud, of the town of Deerwood, November 2d:

There was a prairie fire August 30, which originated on Sec. 19 (Town 159-46) and burnt over 80 acres. No damage. Weather dry. It was put out in two hours after it started.

October 14, was a prairie fire which burnt over 3,500 acres, destroyed five tons of hay of the value of \$15. It came in at the northwest corner of the town from the town north, which is 160, range 46. Weather very dry and windy.

On the 15th of October there was a fire which ran over 160 acres, but did no damage. It started in the town of Hazelton, went through the town of Jupiter, into the town of Spring Brook, from Spring Brook into this town. It was extinguished in eight hours.

John Paulson, of the town of Hallock, October 24th:

On October 15 a fire occurred in the south part of this town, which burnt over nearly two thousand acres, a part being three-year-old grass, but doing no damage. It came from the township south of us.

On October 22 a fire ran over about 1,200 acres, but did no damage; wind blowing from northwest.

E. Haglund, chairman of the town of Hazelton, October 17th:

On the 14th instant a prairie fire, which originated on Sec. 29, burnt over 3,800 acres and destroyed hay of the value of \$150. There was a heavy wind so we could not do anything with it, and it was soon beyond our control.

Oscar Englund, chairman of the town of Jupiter, October 28th.

On the 14th instant a fire burnt over 9,500 acres of prairie and light timber, destroyed 90 tons of hay, one stack of grain, three log buildings, with 200 bushels of barley, and did damage to the amount of \$1,200. It seems to have been set in a low place on the south fork of Two Rivers, on the northwest quarter of Sec. 29, Township 161, Range 47 (town of Hazelton, adjoining on the north); was first noticed at 9 o'clock A. M. Here it seems to have made slow headway. The wind was light, S. W., drove it toward the river, and could have been stopped very easily after it was first noticed; but at about 2 o'clock P. M. the wind changed over to a high N. W. and drove the fire into this town as fast as a horse could trot. This fire came four miles wide all at once and did more damage in this town than all previous fires since the town was settled and could not be stopped, but went on without bound. The weather was dry, and high wind from the northwest.

Willard O. Gardiner, of the town of Richardsville, October 25th.

There was a prairie fire the 4th instant which originated on Sec. 8, by burning around hay stacks. It ran over 640 acres; destroyed two stacks of hay. Damage, \$40, and was put out in 12 hours by plowing and with wet sacks. Wet night was in our favor. Very dry and windy in the morning.

A. F. Johnson, of the town of Skane, October 24th:

On the 3d instant a field fire burnt over 40 acres and destroyed 50 tons of hay; damage, \$75. A hired man was set to burn stubble and the fire got beyond his control, burned over into Chas. Lander's meadow and up to field. The weather was dry.

On the 15th instant a prairie fire originating on land occupied by Chas. Lander, ran over 1,400 acres and destroyed 19 tons of hay; damage, \$43. It had got so much headway before it was noticed it could not be extinguished and it burnt up to a plowed field. Weather very dry and southwest wind.

H. N. Lindberg, of the town of Svea, October 27th:

On the 27th of September a fire burnt over 7,000 acres of mostly swamp land and destroyed 100 tons of hay. It was set by tramps who were after-

wards arrested. It went out when it got to the public highway. Weather was dry. The reason why we did not try to put it out was that the damage was done before we had time to get there.

On October 15th, a fire originating on Sec. 4, burned over 4,000 acres and destroyed 50 tons of hay. It was set to burn a little grass around the buildings. Sixteen persons were called to help extinguish it, which was done by plowing around it, also using wet sacks. Weather dry with much wind.

E. A. Johnson, of the town of Tegner, October 20th:

A prairie fire which originated on Sec. 15 this day, and supposed to have been caused by hunters, burnt over 800 acres but did no damage. Four persons were called to help extinguish it, which was done in ten hours after it started by plowing and using wet sacks. Weather windy.

Hans Haugen, of town of Tegner, October 22d:

On this date a fire, which was set by a railroad locomotive on Sec. 19, burnt over 500 acres, but did no damage. It was extinguished by using wet sacks. Weather windy.

Christian E. Braathen, of unorganized township 160, range 46, October 9th:

A forest fire, which originated on Sec. 27, on the 29th of September, burnt over about 80 acres of brush and destroyed some young poplar trees. It was extinguished in three hours after it started. We started to extinguish the fire with sacks, but we laid them aside and took brush, which was much better. Weather dry.

Same, October 14th:

On the 13th instant a fire, which originated about 5 P. M., on Sec. 35, burnt over 3,200 acres of swamp, brush and meadow and destroyed 100 acres of light poplar timber and about 80 tons of hay; damage, \$660. I did not know of the fire until the next morning, so we did not get it extinguished before 9 o'clock P. M. the 14th, which was done by use of wet sacks. Wind was southwest in the morning, but at noon turned to a storm from the northwest.

Same, October 24th:

A fire occurred the 13th, 14th, 15th and 16th instant, burning over about 5,000 acres of prairie, meadow, swamp, and brush land, partly settled. As far as I can learn it started in the town of Hazelton near the south line, went through the town of Jupiter (which joins this on the west) and came into this town about 12 o'clock at night and burnt the west side of the town. The weather was dry and very windy. The wind changed from south and brought the fire back again and the next day it turned and blew from the north again. It was extinguished by wet sacks, by plowing and burning firebreaks. We had to burn a fire strip about one mile long to save the rest of the town.

#### LAC QUI PARLE COUNTY.

Henry Tasto, Sr., of the town of Arena, November 30th:

A fire was set October 28 on Sec. 12 to a straw stack around which the party had made an insufficient firebreak. The weather was dry and windy

and the fire spread over six acres, destroyed a five-acre grove and five tons of hay. Damage, \$315. The neighbors came with horses and plow and kept on plowing around the fire till it was extinguished.

Louis Anderson, of the town of Lake Shore, November 18th:

About the 15th of October a fire, supposed to have been caused by ashes from a steam thresher or tobacco pipe, ran over fifty acres of prairie and meadow and destroyed 30 tons of hay of the value of \$60. It was extinguished in four hours after it started with the help of twelve persons using wet sacks and plowing a short distance. There was quite a breeze from the south.

Carl Redepinning, of the town of Walter, November 23d:

About the 15th of October a fire was set by a railroad locomotive on Sec. 26, and ran over twenty acres, burning only grass. It was extinguished, in three hours after it started, with help of six persons, simply by plowing and using wet sacks.

#### LINCOLN COUNTY.

Robert Boulton, of the town of Alta Vista, November 23d:

On the 23d of October, a fire, caused by burning thick stubble on Sec. 14, burned over 320 acres and destroyed three stacks of hay of the value of about \$75. It was extinguished, with the help of twenty persons, in four hours after it started, by plowing firebreak, by beating the fire with wet sacks and by back-firing. Weather was windy.

L. M. Townsend, of Ash Lake, December 14th:

May 10, a fire, which originated on vacant land in Sec. 11, burnt over 320 acres and destroyed three small stacks of hay of the value of \$10. It burnt itself out in the evening.

Amos E. Smith, of Diamond Lake, October 13th:

On the 25th of August, wind very high, a fire burnt over 30 acres of prairie; destroying nothing but grass. It was extinguished with wet sacks six hours after it started.

Joseph F. Schwartz, of the town of Hansonville, November 24th:

On the 13th of August a fire, caused by lightning, destroyed grain of the value of \$260. The fire was extinguished, with the help of ten persons, by plowing around it and hauling water. I would suggest there should be bells on school houses so as to give the alarm in case of fires.

John A. Stegner, chairman of the town of Hendricks, November 26th:

On the 21st of October a fire, caused by burning stubble, burnt over Sec. 33, being all wild land, also destroyed one stack of hay of the value of \$20. The wind was blowing strong from the east. I was one of a threshing crew that helped extinguish the fire, which was done in five hours after it started. The party who set the fire worked like a hero with team, thereby saving three other stacks of hay. This was the only prairie fire in town doing damage.

## LYON COUNTY.

C. H. Middleton, of the town of Lake Marshall, November 21st:

There was a fire on Sec. 33, vacant land, probably caused by hunters, which burnt over 320 acres, destroying nothing but dry prairie grass. The prairie fires in our town are confined to small areas, as most of the land is under plow.

## MARSHALL COUNTY.

John Craik, of the town of Bloomer, November 30th:

The 1st of September, a prairie fire, which originated on Sec. 36, burned over 320 acres and destroyed three stacks of hay, of the value of \$350. It went out itself seven hours after it started. Weather was windy.

Martin Besancon, of the town of Donnelly, November 27th:

The 15th to 20th October a fire, which started on Sec. 22, cause unknown, and burnt over 11,000 to 12,000 acres, destroying nothing but dry grass. No means were employed to put it out. Everybody seemed to think it was a good thing that it was burnt over.

J. M. Leslie, of the town of Comstock, November 23d:

A prairie fire occurred in September in the southeast part of Town 155, Range 46, and burnt over 2,560 acres, destroying nothing but dry grass. It came from south of the county line, ran northwest and was extinguished by rain.

Peter A. Risburg, of the town of East Valley, October 21st:

A fire October 19 burnt over 80 acres of brush. I had it extinguished with the help of two men in three hours after it started.

H. O. Ekerdalen, of the town of Holt, October 8th:

September 30th a fire, which came from the town of Spruce Valley, burnt over 800 acres of prairie in the northwest part of this town (156-43). Nine persons were called to help extinguish it, which was done in eleven hours. We used wet sacks and brooms made of green willows. The weather was windy and towards midnight still and damp.

N. C. Rood, of the town of Nilson Park, October 17th:

On the 14th instant a fire burnt over 300 acres of brush and prairie land in the northern part of this town (158-46) and destroyed one stack of hay of the value of \$40. It started away off in Kittson county, about 8 to 10 miles north of the north line of this county, and came down in full blaze, because the wind was very strong and everything dry. Twelve persons assisted in extinguishing the fire. We had one team and plow—sacks, blankets and lots of water, and every man worked well. I stayed up all night and looked after it half of the next day. I feel sure that we saved several hundred dollars worth of property.

D. L. Johnson, of the town of Spruce Valley, November 19th:

The middle of October, the weather being hot and windy, a fire burnt over 1,000 acres of swamp in the south part of the town (157-43) and destroyed an abandoned house of the value of \$30. Small patches were burnt in the town by settlers, who burnt old grass and brush, but no damage done.

John O. Wang, of the town of West Valley, November 14th:

On the 24th Oct., weather being dry, a fire burnt over seven acres of meadow. Damage, \$10. It was extinguished by me five hours after it started.



## MURRAY COUNTY.

M. Shaw, of the town of Holly, January 24th:

There was a fire September 27 in the southwest part of the town, which burnt over 640 acres of prairie and destroyed hay of the value of \$230. The weather was windy. It was extinguished in six hours after it started by plowing, also whipping with sacks.

M. Masterson, of the town of Iona, November 28th:

September 28 a fire, caused by hunters on Sec. 18, burnt over fifty acres and destroyed 30 tons of hay of the value of \$90. It was put out in two hours after it started by plowing and whipping it with wet grain sacks. Weather quite warm and calm.

## NOBLES COUNTY.

Louis M. Ipson, of the town of Elk, November 24th:

On the 2d of May a fire, which originated on Sec. 35, burnt over 40 acres and destroyed a small stack of hay. It was put out in a few hours after it started.

## NORMAN COUNTY.

P. J. Branken, of the town of Waukan, November 28th.

A fire in the east part of this town October 26 burnt over 500 acres of prairie and destroyed ten tons of hay of the value of \$30. It came from the White Earth Indian reservation. The weather was very dry with strong north-east wind.

## PIPESTONE COUNTY.

John Anderson, chairman of the town of Grange, October 5th:

August 30 a fire, set on section 14 by train on the Great Northern Railroad, burnt over 12 acres of prairie, 5 acres of grain and 8 acres of young trees. It was put out in two hours by plowing and beating with brush. Weather windy.

## POPE COUNTY.

H. C. Carpenter, chairman of the town of Hoff, December 3d:

A fire October 8th, which originated in the adjoining town of Clontarf, Swift county, from a passing freight train, ran into this town and destroyed 75 tons of hay of the value of \$225. It was extinguished in 7 hours by plowing and beating with wet sacks. Weather very dry and windy.

## POLK COUNTY.

Erik E. Skiple, chairman of the town of Badger, December 14th:

October 15 a fire, which came from the town of Grove Park (149-43) burnt over 1,000 acres of prairie and meadow. It was extinguished by plowing and using wet sacks. Weather dry and windy.

John P. Goerger, chairman of the town of Belgium, November 23d:

On the 23d September a fire originated on Sec. 11, caused by hunters. Burnt over about 2,000 acres. Weather dry. The fire ran as far as the N. P. R. R. track and then stopped.

C. P. Swanson, chairman of the town of Bray, December 3d:

September 27 a fire burned over about 200 acres of prairie in the north part of the town; destroyed nothing but grass. Was probably set by hunters in the town of Neemedal (154-45). It was extinguished in 8 hours after it started.

L. J. O'Neil, chairman of the town of Chester, December 2d:

On the 24th September a fire started in the southwest part of the town, in the swamp at the foot of the hills, burnt over 6,000 acres of prairie and brush and destroyed a large number of small groves and 76 tons of hay. Damage, \$200. Weather dry with strong southwest wind during the day. The fire was extinguished by a slight rain about midnight.

C. Wittensten, chairman of the town of Farley, November 18th:

October 20 a fire, which originated from burning straw on Sec. 24, burnt over about 20 acres of meadow and destroyed hay of the value of \$50. It was extinguished by plowing around it. Weather dry and high wind.

George M. Swift, chairman of the town of Grove Park (149-43), November 21:

In October, a fire in the north part of the town burnt over about 600 acres of prairie and meadow and destroyed a stack of hay. Damage, \$40. It came in from the towns north of this town. Fires were burning north of here for several days. Mike Hulquist and myself were out all night helping protect neighbors' property. No warning placards have been sent here for posting and very little attention has been given further than each one has plowed fire guards to protect his property. Nearly all the fires we have in this vicinity originate north of us every year.

H. Galbraith, chairman of the town of Hammond, November 7th:

On the 19th October a fire, which originated on Sec. 36, Town 149, Range 47, burned over several thousand acres of prairie in this town (148, range 47), and destroyed, as far as I can learn, 150 tons of hay. I suppose it was caused by parties burning around their hay stacks. It burned for about four days. It was windy the day it started and it burnt as far as the Sand Hill river on that day. It was burning the evening of the 24th.

Charles Perrault, chairman of town of Lake Pleasant, December 4th:

A fire that was set by sparks from a railroad locomotive October 25, on Sec. 3, burnt over about 50 acres of prairie and light timber; damage, \$100. There was a hot, dry wind from the west. There were three other fires the past season, one set by sparks from a locomotive, but they were all extinguished before any damage was done.

O. J. Tweet, chairman of the town of Norden, November 23d:

On the 25th October a fire on Sec. 18 burnt over 200 acres. Nothing destroyed but old grass. It was extinguished by simply cutting some willows and whipping it out.

John O. Waslie, chairman of the town of Neemedal (154-45), November 23d:

On the 24th September a fire, which was set to heavy grass along Goose lake, for the purpose, as supposed, to make better pasture next year, burnt

over 4,440 acres, and burnt the soil 6 to 8 inches deep. Estimated damage, \$2,220. It was extinguished in two days by plowing and fighting it. Very high wind from the southwest.

Same, December 8th:

A fire October 17, set by some person unknown, to vacant school land, burnt over 1,830 acres. Damage, \$915. It was put out in course of 40 hours by myself and six other men, by plowing one mile in a straight line east and west and by fighting it.

P. Filbin, chairman of the town of Parnell, November 19th:

On the 22d October a fire originated on Sec. 27 (Township 151, Range 46), about 12:30 P. M. It was seen immediately after a man had driven through the section on a road. It burnt over 1,000 acres. The weather was dry and windy, blowing from the north. It was extinguished in 20 hours by preventing it from crossing the graded roads; wet sacks also used. There were two other prairie fires about the same time which burned over about 2,000 acres, but did no other damage.

Nels M. Johnson, chairman of the town of Polk Centre, November 21st:

About September 23, a fire set to weeds that had been mowed and raked into piles on Sec. 25 (Town 152-45) burnt over 500 acres of meadow and destroyed about 20 tons of hay of the value of \$50. It was extinguished in four hours after it started, by a crew of threshers with wet sacks; also spades, teams and plows. No fire warden was present. Weather very warm and south wind. A farmer, by name of James Sutor, plowing near by with four horses, plowed through the flames in several places and saved farm buildings and grain stacks in three different instances with great danger for himself and teams; also, Charley Johnson performed heroic work in extinguishing the flames.

Joseph Pigeon, chairman of the town of Poplar River, December 15th:

September 12, at 3 P. M., weather being windy, a fire which originated on Sec. 17, from cause unknown, burnt over 1,000 acres and destroyed one stack of hay. Damage \$50.

Ole Olson, Jr., chairman of the town of Russia, November 9th:

On the 24th October a fire burnt over about 3,200 acres on Secs. 6, 7, 5, 8, 9, 16 and 15. No damage. Am unable to learn how the fire originated. There was also a prairie fire October 19th, which swept over all of section 31 and part of 32. No damage. The fire came in from the township west.

Gust. Christianson, chairman of the town of Skandia (147-47), November 6th:

About the 25th October a fire burnt over 300 acres of swamp and meadow in the northwest part of the town. No damage. Not known how it originated. Nothing was done to stop it and it was put out by snow the night of the 30th.

W. R. Long, chairman of the town of Tilden, November 20th:

On the 26th October a fire on Sec. 17 burnt over 300 acres of principally prairie, and destroyed one house, which was partly down. Supposed to have been caused by hunters. It went out itself in 18 hours after it started.

A. P. Moen, chairman of the town of Vineland, November 19th:

About the 27th of October a fire in the east part of this town (148-48) burnt over 10,000 acres and destroyed some hay. It went out of itself. It came from the town of Hammond, lying due east. There was fire in the swamps east of this town several days before it struck this town.

#### REDWOOD COUNTY.

A. J. Weldon, chairman of the town of Charles, November 30th:

On the 14th August a fire, caused by burning mustard which had been rolled, spread over 80 acres of field and prairie and destroyed a few shocks of wheat of the value of \$10. The weather was still and hot. If the wind had risen that day the fire would have swept the country of thousands of dollars, as it was very dry.

J. A. Turnbull, chairman of the town of New Avon, November 21st:

A fire on Sec. 18, October 15th, caused, so far as I can ascertain, by accident, burnt over 200 acres of meadow and destroyed 50 tons of hay in the stack. Damage, \$75. It was extinguished in three hours after it started, by plowing. Weather fair with northwest wind.

August Sipetzky, chairman of the town of Sundown, November 30th:

On the 15th September a fire on Sec. 8, caused by burning stubble, spread over 20 acres of field and destroyed four stacks of wheat. Damage, \$60. It was extinguished by plowing in two hours.

Theodore Daub, chairman of the town of Vail, November 24th:

On the 5th October a fire on Sec. 14, caused by a threshing machine, burnt over five acres. No damage.

#### RENVILLE COUNTY.

John O. Colsrud, chairman of the town of Crooks, November 30th:

There have been some small fires in this township this past fall, caused by farmers trying to burn wheat stubble to kill the Hessian fly; in hard wind the fire has gone a little farther than was expected but they have immediately controlled it by plowing.

H. J. Jungclaus, chairman of the town of Osceola, November 27th:

On the 14th September a fire, set by some unknown person on vacant land in section 17, burned over 30 acres of prairie and destroyed 30 tons of hay; damage, \$60. It was put out in five hours by beating it with wet rags. No fire warden was present. Mrs. Larson worked the hardest and saved two stacks.

Herman Schmechel, chairman of the town of Wellington, December 4th:

On the 3d September a fire on Sec. 14, caused by burning stubble, spread over 40 acres of field and meadow and destroyed four wheat stacks of the value of \$90. It was extinguished by plowing around the field and meadow. Weather dry and still.

## ROSEAU COUNTY.

M. Barto, chairman of the town of Barto (161-43), October 21st:

Through the carelessness of some person unknown, a fire started September 23d on Sec. 18 and burnt over 19,000 acres and destroyed timber, hay, claim houses and farm machinery; damage, \$1,000. A high wind prevailed. It burned during five days in this town and extended into the town of Soler adjoining on the north. It was extinguished by burning itself out.

S. A. Anderson, of the town of Dieter, October 27th:

On the 25th instant a fire, originating on Sec. 9, from cause unknown, spread over 700 acres of prairie and brush land and destroyed about 30 tons of good hay. Damage, \$90. It was encircled and put out by hand, twelve persons assisting.

Sven E. Oie, of the town of Dieter, October 27th:

On the 25th instant, about 9 o'clock A. M., a fire, which originated on section 6, burnt over 1,100 acres of prairie and brush land and destroyed about 50 tons of good meadow hay. Damage, \$150.

R. A. Flaa, chairman of the town of Malung, November 27th:

On the 14th October, at 11 o'clock, a fire originated from cause unknown on land occupied by Mrs. Oland, in Sec. 28, and burnt over 800 acres of brush land, destroyed six tons of hay and a claim shanty. Damage, \$40. Hard northwest wind. It was extinguished in 10 hours.

Fred Andol, chairman of the town of Pohlitz (163-42), December 29th:

On the 22d September a fire, which originated over by the sand ridge about two weeks before it came here, burned over 2,600 acres in the southwest part of this town; destroyed four stacks of wild hay. Damage, \$80. It was extinguished with willow brooms and by setting backfires. I staid with the fire two days and one night, and without letting my men go home for meals, and I did not go away myself until the fire was extinguished.

[To a special inquiry Mr. Andol replied]:

The sand ridge begins in the town south of this town, runs southwesterly and ends about twenty miles east of the village of Stephen. Its elevation is about 20 feet and breadth from ten to forty rods. It is covered with brush and timber. The stage road lies on this ridge and is settled the most of the way.

Thos. P. Kelly, chairman of the town of Soler (162-48), November 14th:

On the 23d September a fire, which came from the town of Barto, adjoining this on the south, burnt over 19,000 acres of light timber and prairie and destroyed hay, houses, groves and machinery. Damage, \$1,000. Weather dry and windy. The fire continued two weeks. The most of the men here are compelled to go out to work in the fall and only the women were left to protect their own places. I learn from good authority that the fire started on the northeast quarter of section 29, township 161, range 43, and that the man who set it has left for Dakota till matters quiet down.

Matt Barto, of the town of Soler, October 21st:

On the 1st instant a fire, which originated in the town of Barto, burnt over 24,000 acres of field, prairie, brush and light timber; destroyed hay, claim shanties, houses and machinery. Damage, \$1,500. The fire could not be extinguished; settlers protected themselves as best they could. Weather windy first day, second day calm.

Hans Tellefson, chairman of the town of Spruce, November 28th:

The 14th October a fire on Sec. 31 burnt over 60 acres of brush and meadow and destroyed 3 tons of hay. Damage, \$6. It was put out by backfiring. Weather windy and from the west.

L. P. Lofsted, of the town of Spruce, Nov. 27th:

October 24th a fire, which originated on Sec. 7, burnt over 300 acres of swamp and brush; destroyed 30 tons of hay of the value of \$60. It was put out by backfiring. Weather windy.

N. E. Nelson, of the town of Spruce, November 30th:

On the 25th October a fire in the northeast part of this town (162-39) burnt over 3,500 acres of swamp and prairie. It is supposed to have been set by two men from another town hunting chickens and looking for cedar. Was extinguished by backfiring and using wet sacks.

Charles Hedlund, chairman of the town of Stafford, October 15th:

A fire the 3d October, which originated on Sec. 15, being vacant land, destroyed 19 tons of hay. Damage, \$28.50. It was extinguished by plowing and using wet sacks. Weather warm and windy.

#### STEVENS COUNTY.

A. A. Peck, chairman of the town of Hodges, October 12th:

On the afternoon of Sept. 3 a fire on Sec. 19, caused by a railroad locomotive, burnt over three acres and destroyed wheat in shock of the value of \$15. It was extinguished in two hours by plowing around it. Weather very dry.

On the 23d September a fire on Sec. 28, caused by a locomotive, burnt over 60 acres of wild prairie. It burnt to breaking and went out itself. Weather dry.

George Griffith, of the town of Pepperton, October 9th:

A fire on the 8th instant on Sec. 15, caused by a threshing engine, burnt over about 320 acres of prairie. It was put out in ten hours after it started, by six persons, who were called to help, with wet sacks. Weather dry and windy.

Same, October 18th:

On the 16th instant a fire in the northwestern part of the town of Morris, caused by a hired man setting fire to stubble, burnt over 340 acres of field and prairie and destroyed about 100 tons of hay. Damage, \$250. It was extinguished in eight hours after it started by work of ten persons hauling water with team and using wet sacks. Weather dry and a very high wind.

## SWIFT COUNTY.

A. O. Grendahl, chairman of the town of Camp Lake, November 19th:

On the 14th October a fire, caused by burning stubble on Sec. 11, burnt over 80 acres of prairie and destroyed some hay. Damage, \$20. It was put out in three hours by seven persons with the use of wet rags.

Martin McAndrew, chairman of the town of Tara, November 28th:

On the 1st day of October a fire on Sec. 11 burnt over 300 acres of field and prairie and destroyed seven stacks of hay. Damage, \$105. A hired man set fire to stubble after plowing a firebreak around the field, fire jumped the break to prairie and meadow. Every effort was made to extinguish it by neighbors, which was done in 12 hours after it started.

Olof Olsen, chairman of the town of Torning, November 28th:

On September 25 a fire, caused by burning stubble on Sec. 28, burnt over 50 acres of meadow and destroyed ten tons of wild hay of the value of \$25. It was extinguished in three hours, eight persons helping, by plowing and smouldering. Weather warm and windy.

## TRAVERSE COUNTY.

E. J. Hurley, chairman of the town of Taylor, November 21st:

On the 22d September a fire on Sec. 17, caused by burning stubble and straw, burnt over 80 acres. It was extinguished in three hours by plowing firebreaks. Weather was windy.

## WILKIN COUNTY.

John A. Falla, chairman of the town of Akron, March 19th, 1897:

On or about September 20 a fire burnt over 5,700 acres of prairie, field and meadow. Cause unknown. Weather was still all day. I was sick and could not attend, and as no damage was done I did not pay any attention to it, but as I am elected chairman again I will try and do what I can this year.

Philip Heider, chairman of the town of Andrea, December 10th:

On the 26th September a prairie fire burnt over 2,400 acres in the southwest part of the town. No damage. Was caused by the carelessness of hunters. It died out during the night time from heavy dew.

Hugh McDonald, chairman of the town of Brandrup, November 25th:

A field fire on Sec. 2, caused by burning a straw pile after the machine had left the setting, burned over 20 acres of stubble and destroyed nine stacks of wheat of the value of \$350. It was extinguished in two hours after it started by a threshing crew.

Knudt O. Hills, chairman of the town of Manston, December 7th:

In the last part of October a fire, which originated on Sec. 36 (school land), burnt over about three sections, but did no damage. It was put out in six or eight hours after it started by backfiring. Weather windy and dry.

Stanislaus Bulik, of the town of Mitchell, October 13th:

A big prairie fire came up from the south on the 7th of this month and would have done a great damage to our town but I ordered out a threshing crew and we stopped it without its doing much damage. Where the fire started I cannot tell.

Same, December 18th:

The fire of October 7th burnt over 1,500 acres of prairie and meadow. It did no damage that I know of in this town. It was extinguished in 14 hours after it came into this town by plowing, also by pounding it with wet bags. The weather was dry and windy. It is said that the fire was started by the N. P. R. R. near Breckenridge, and it came in a northwest direction till it struck this town.

#### YELLOW MEDICINE COUNTY.

Chresten Olson, chairman of the town of Florida, September 15th:

On the 29th August a fire, set by railway freight train on Sec. 23, burnt over 600 acres, 70 acres being field and two acres timber and apple trees; destroyed four stacks of wheat and two stacks of hay. Damage, \$285. Fourteen persons were called to help extinguish it, which was done in five hours after it started by teams plowing in the field and using shovels and wet rags. Weather warm and windy.

Same, November 24th:

The railroad company have admitted having caused the fire as reported August 29, and settled for the damage.

Gust. Miller, chairman of the town of Hazel Run, October 29th:

A fire on the 3d instant, caused by men trying to burn around their hay stacks on Sec. 11, burnt over 250 acres of prairie. It did no damage, as we fought it out with wet sacks before it destroyed any property. The weather was dry and a hard wind blew from the south.

Same, October 19th:

There was no fire warden assisted in putting out the fire except myself. When I learned that the prairie was on fire I took my team and went to the houses of those neighbors that I knew had property unprotected and informed them that the prairie was on fire, and then I started for the fire myself. When I got there there were some parties there already engaged in fighting the fire and the rest soon followed, and we got it out just about dark.



## ANNUAL REPORTS OF FIRE WARDENS.

The Forest Preservation Act of April 18, 1895, requires the Chief Fire Warden to investigate the extent of the forests in the state, together with the amounts and varieties of the wood and timber growing therein, the damages done to them from time to time by forest fires, and the causes of such fires, the method used, if any, to promote regrowth of timber, and other important facts relating to forest interests; the information so gathered to be included in his annual report.

With a view of obtaining information on these points a blank containing questions was mailed to chairmen of town boards and to fire wardens in unorganized territory. The manner in which fire wardens answer or neglect to answer questions submitted to them affords some test of their willing disposition and intelligence. It makes this office better acquainted with them and better able to judge of their reliability and efficiency.

A copy of the questions is herewith submitted and following that extracts will be quoted from some of the answers of fire wardens.

## STATE OF MINNESOTA.

## FIRE WARDEN'S ANNUAL REPORT.

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Answers to be mailed to C. C. Andrews, Chief Fire Warden, St. Paul, Minn.

1. The undersigned is fire warden in town No....., range....., in the county of.....and his post office is.....

[State below the other congressional townships, if any, in your organized township or the townships which you have charge of, in case your territory is unorganized.]

Township No..... Range No.....

Township No..... Range No.....

Township No..... Range No.....

Township No..... Range No.....

Township No..... Range No.....

Township No..... Range No.....

Question 1. If any forest fire occurred in your town or district in 1896 that has not been reported to the Chief Fire Warden, state when and where it occurred, number acres burned over, damage done, its cause and how extinguished. If no fire occurred in your town, state what, if any, extra precautions were taken by you.

Answer.....

Question 2. What, if anything, has occurred in the administration and execution of the law, worthy of comment or criticism?

Answer.....

Question 3. What, if any, recommendation would you make in addition to what is in the Forest Preservation Act of April 16, 1895, for better preventing and extinguishing forest fires?

Answer.....

Question 4. What are the principal dangers or causes of forest fires and how can they best be lessened?

Answer.....

Question 5. Do you notice any increase of popular interest and sentiment for forest preservation and care in preventing fires? If so, how has it been manifested, and what, if anything, have you done to promote this interest?

Answer.....

Question 6. If there are persons who are opposed to the Forest Preservation Act, what, if any, reasons do they give?

Answer.....

Question 7. In case of a serious forest fire in your township, about how many able-bodied male persons over 18 years of age could be depended upon to help extinguish it, as provided by Section 6 of the Forest Preservation Act?

Answer.....

Question 8. What is the prevailing kind of timber in your town and is it dense or open? (If you have charge of more than one township state as to each town.) About how much of the surface is covered by windfalls? How much consists of swamp? If there is a heavy growth of white pine, in what part of the town is it situated?

Answer.....

Question 9. About how much land is there (in acres) in your township (or townships) that is only fit for bearing pine? In what part of the township is it situated, and is it hilly or level?

[By land only fit for pine is meant land which on account of poor soil or very broken or rocky surface would be unfit for field crops or permanent pasture.]

Answer.....

Question 10. To what extent is there a natural growth of young white pines in your township and what is the prospect for the regrowth of such pines if fires are kept out?

Answer.....

Question 11. What, for a rough estimate, do you consider the amount of damage which, previous to the year 1895, has been done in your township (if more than one township, state as to each township) by forest fires, and give some of the facts which support your conclusion?

Answer.....

Question 12. Suppose a farmer has ten acres of white pine, whether in one or several patches, standing sufficiently thick, on soil that is unfit for agriculture or for permanent pasture,—in what amount would such body of pine, when ten years old, increase the value of his farm? And please explain the way you arrive at your conclusion.

[NOTE.—The yield tables of Saxony, Germany, show that an acre in fourth-rate locality, fully stocked with Scotch Pine, at the age of ten years contains 2,600 feet, board measure (though of course not merchantable timber); at the age of twenty years, 6,300 feet; at the age of thirty years, 11,100 feet; at the age of forty years, 16,100 feet; at the age of fifty years, 21,400 feet. We thus see that ten acres of such pine on fourth-rate soil would at the age of fifty years contain 214,000 feet. In locality of first quality, a ten-acre tract of such pine at fifty years of age contains 580,000 feet.]

Answer.....

Question 13. The State of Minnesota, as you are probably aware, has for many years paid bounties for planting and maintaining trees on the prairies. Suppose that the state were to donate white pine seedlings, about one foot in height, to people who would suitably plant them,—please give the address of a few citizens in your town, if there are any, who you think would probably accept and carefully plant and maintain them.

Answer.....

Question 14. About how many acres have been cleared of forest in your town? And what effect, so far as you have observed, has such clearing had upon the supply of water in lakes and streams?

Answer.....

Question 15. How many lumber camps are there in your town this season? About how many feet of pine or other logs do you estimate are being cut in your town (or towns, and in which) the season of 1896-1897?

Answer.....

Question 16. Will you undertake to observe and note the years in which the white pine bears seed bountifully? Any suggestions you can offer for gathering seed of the white pine (without public expense) will be of interest.

Answer.....

Question 17. To what extent are new settlers coming into your town to locate permanently? What are some of the inducements for settlers? What proportion of your town (or towns) will probably become occupied by settlers and brought under cultivation?

Answer.....

Question 18. How many miles of passable natural or artificial wagon road are there in your town, and where situated, and about how much is expended annually for its maintenance?

Answer.....

Question 19. What is the amount of your account presented, or to be presented, for your services as fire warden in 1896?

Answer.....

Question 20. Please state any other fact that you think may help the cause of forest preservation.

Answer.....

P. O.....

Date..... Signature.....

Name of Organized Township.....

### EXTRACTS FROM ANSWERS OF FIRE WARDENS.

Question 3. What, if any, recommendation would you make in addition to what is in the Forest Preservation Act of April 18, 1895, for better preventing and extinguishing forest fires?

#### AITKIN COUNTY.

James McAskill, of Hazelton:  
To have the fire wardens paid.

#### BECKER COUNTY.

Knud Benson, of Lake Eunice:  
The law is good as it is if enforced.

W. H. Colgrove, of Osage:

- A great many of the fires could be prevented if the Indians were kept on their reservation, for everywhere they camp they are almost sure to leave some fire.

## BELTRAMI COUNTY.

Robert Dunn, of Town 145, Range 35:

To allow no clearing fires to be set after June 1 of each year.

## BENTON COUNTY.

John Wilson, of St. George:

Nothing, only enforce it.

## CARLTON COUNTY.

John Atkinson, of Atkinson:

To make lumbermen burn their tree tops and rubbish after logging early in the spring before there is danger of fire spreading.

## CROW WING COUNTY.

C. H. Adams, of Deerwood:

To see that the present law is enforced and posters are kept posted up. I have noticed in some of my travels posters have been torn down by mischievous boys.

## HUBBARD COUNTY.

Daniel Buchacker, of Town 140, Range 33:

The compelling of all companies which cut logs during the winter to burn the tops by the first day of May following.

Frank Kruft, of Towns 141 and 142, Range 33:

To have all combustible matter burnt up early in the spring by the parties who have been logging or cutting cord wood during the winter.

John F. Wilcox, of Town 144, Range 34:

I think if the state would employ fire wardens and pay them direct they would take more interest in the work. As it is now the county commissioners set the price of our work.

## ITASCA COUNTY.

A. A. Chase, of Deer River:

The shooting or hanging of a few vagrants that mainly cause the fires.

C. D. Lewis, of Iron Range:

That lumbermen be compelled to burn their brush in the spring before fire will run in the standing timber.

## KANABEC COUNTY.

John Keenan, of Comfort:

I think a few roads if once opened and kept in repair would check the fires.

## PRINCIPAL CAUSES OF FOREST FIRES.

Question 4. What are the principal dangers or causes of forest fires and how can they be lessened?

## AITKIN COUNTY.

E. O. Brown, of Kimberly:

Railroad engines, Indians, hunters and cruisers. Railroad companies should be compelled to keep their right of way clear from combustible material.

O. G. Peterson, of Nordland:

Camp fires left by Indians and hunters.

Lars L. Anderson, of Town 46, Range 24:  
Hunters.

I. O. Winters, of Malmo:

Campers and men burning their clearings.

## BECKER COUNTY.

Charles S. Palmer, of Evergreen:

Careless hunters and farmers burning their brush.

George Dorman, of Holmesville:

Burning brush and camp fires.

Emanuel Berg, of Lake Park:

Long continued drought and carelessness in setting fires.

Hans Deierhoi, of Richwood:

Principal cause of fires is the burning of brush in dry weather.

Mischel Warter, of Silver Leaf:

They can be lessened by teaching the principles of forestry in the public schools.

B. F. Briggs, of Spruce Grove:

Burning swamps for meadow lands. Can only be lessened by constantly cautioning people to be careful.

## BELTRAMI COUNTY.

Albert B. Johnson, of Copley:

Clearing land is the principal cause. April is the best time to burn brush.

J. P. Nygaard, of Popple:

Principal causes are hunters and Indians camping in the woods.

Henry Peck, of Town 147, Range 36:

Principal causes are camp fires and hunters.

Charles E. Scott, of Towns 143 and 144, Range 36:

Lumbermen leaving the brush on the ground after taking off the timber.  
By having the brush piled and burnt in the spring.

## BENTON COUNTY.

M. J. Lynch, of Glendorado:

The principal dangers are from hunters and tramps.

James McCulloch, of Graham:

In my opinion the principal dangers are from hunters.

W. J. S. Stuart, of Granite Ledge:

From railroads and outside hunters.

## CARLTON COUNTY.

Peter Jackson, of Knife Falls:

The principal danger of fire in this town is from clearing land, and I think the best way to lessen it would be to have a man do nothing else in the dry time but watch those places.

H. M. Waldref, of Mahtowa :

The principal cause is from willfully setting fires and the only remedy is to prosecute some of the violators of the law.

William Sheils, of Twin Lakes:

Dry weather.

## COOK COUNTY.

Emil Eliason, of Hoveland:

From explorers. By posting placards.

Olof Berglund, of Town 61, Range 1 W.:

From burning or clearing in dry weather.

Chester S. Durfee, of Towns 61 and 62, Range 2 E.:

From tourists, fishing parties, explorers, hunters, woodsmen, surveyors and many inexperienced homesteaders.

John C. Kelly, of Towns 61 and 62, Range 5 W.:

Shotguns and mineral prospectors.

C. A. A. Nelson, of Lutsen:

Cruisers looking for lands starting fires for their tea and failing to extinguish them.

George Wartner, of Gunflint Lake:

Camp fires left unextinguished by prospectors, etc.

## CROW WING COUNTY.

Frank Mills, of Maple Grove:

Hunters and men going a good ways from home to make hay.

## DOUGLAS COUNTY.

V. H. Benn, of Holmes City:

Farmers putting out fire and not watching it.

Wm. Knapton, of La Grand:

Principal cause is railroads, and next hunters.

Anton Kondela, of Lake Mary:

By the farmers in the woods clearing and burning the brush off.

#### HOUSTON COUNTY.

Thomas Corcoran, of Brownsville:

Nonresident hunters are the cause of most of the forest fires in this locality.  
By the time the hills are on fire the hunters are gone.

#### HUBBARD COUNTY.

M. L. Moore, of Akley:

Settlers clearing up land, hunters and campers. Post notices and keep it on their minds.

R. S. Wagner, of Badoura:

Hunters leaving camp fires. The best thing is to make an example of some of them.

Chris. Anderson, of Henrietta:

Nonresident hunters and fishers.

DeWitt Clason, of Towns 142 and 143, Range 35:

Old slashings are principal places where the Indians burn off the grass and down timber for early feed, or rather late feed, for deer.

#### ISANTI COUNTY.

Eric Tornberg, of Maple Ridge:

The principal danger in my opinion is by setting fire to brush heaps and other rubbish in the latter part of the summer, not thinking about the terrible result that may accrue in a few days of dry and hot wind.

J. H. Chapman, of Spencer Brook:

Carelessness of duck and chicken hunters and of some farmers in clearing land. Can best be lessened by a rigid enforcement of the present law.

Peter Soderstrom, of Stanford:

The most danger is by hunters coming up from the cities in the fall. They have done the most damage by fire in this town.

#### ITASCA COUNTY.

A. A. Chase, of Deer River:

The accumulation of dead and down timber and the class mentioned in my answer to question No. 3, and the dangers can only be lessened by the removal of one of them.

Joseph H. Gardner, of Town 63, Range 23:

Camp fires in dry weather and burning old choppings to destroy timber stealing.



E. R. Lewis, of Ray:

Fires are generally started by Indians; sometimes by cruisers and prospectors camping out.

G. C. Hooker, of Swan River:

The principal cause of fires in this locality is trespassers setting their old choppings on fire to hide their works.

W. A. Dafter, of Town 70, Range 25:

In this locality the chief dangers of forest fires are from carelessness of prospectors and cruisers passing through the country and from fires started by settlers in clearing land. Enforce the law fully.

C. D. Lewis, of Iron Range:

The danger is from hunters and cruisers camping out.

#### KANABEC COUNTY.

C. P. Larsen, of Arthur:

Most of the fires are set by railroad engines.

W. F. Hillman, of Hillman:

Carelessness by settlers and logging railroads.

George Hinchey, of Kanabec:

The principal danger is caused by railroad locomotives and section men burning right of way.

#### LAKE COUNTY.

R. H. Slater, of Beaver Bay:

From Indians and explorers.

A. H. Wegner, of Towns 62, 63 and 64, Range 8:

From homesteaders and travelers.

#### MILLE LACS COUNTY.

G. B. Reeves, of Greenbush:

Sparks from locomotives.

#### MORRISON COUNTY.

W. Wolke, of Buh:

Threshing engines and hunters are far too careless.

A. Lund, of Cushing:

Fire getting away from parties burning meadows too late.

Watkin Davis, of Elm Dale:

Setting fires to old stumps and brush piles and letting it go.

John Brown, of Parker:

Most all the fires originate from burning marsh in the spring in order to obtain more grass for hay.

Charles L. Nelson, of Scandia Valley:

Blueberry pickers and emigrants.

## OTTER TAIL COUNTY.

F. C. Cole, chairman of town of Homestead:  
From people who willfully set fire just to see it run.

## PINE COUNTY.

J. F. Wilkin, chairman of town of Finlayson:  
Railroad engines.

Geo. L. Stevens, chairman of town of Rock Creek:  
The causes of fire here are where men are clearing up land and burning brush. The fire sometimes gets away from them.

## ST. LOUIS COUNTY.

Martin Lepak, chairman of town of Gnesen:  
Hunting parties and land lookers. By prosecution as required by law.

J. F. Hobbes, of unorganized territory:

Causes aside from locomotives are from unextinguished camp fires of indifferent and lawless men passing through the woods. These fires may be materially lessened by arrest and punishment of the culprits and a forest patrol.

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## INCREASE OF POPULAR INTEREST.

Question 5. Do you notice any increase of popular interest and sentiment for forest preservation and care in preventing fires? If so, how has it been manifested, and what, if anything, have you done to promote this interest?

## AITKIN COUNTY.

A. H. Engberg, of Farm Island:

Yes, everyone seems to be more careful about fire. Our warning cards do good work.

E. O. Brown, of Kimberly:

People in general are more careful in handling fire.

J. A. Sandborg, of Malmo:

Interest decreasing, as the county commissioners disallowed bills for services in extinguishing fires.

O. G. Peterson, of Nordland:

I do. People who reside here are more careful about setting fire on meadows.

## BECKER COUNTY.

Knud O. Benson, of Lake Eunice:

I think I do. People are very careful how they burn brush and rubbish.

## BELTRAMI COUNTY.

Robert Dunn, of Town 145, Range 35:

Yes, amongst hunters and campers.

J. P. Nygaard, of Popple:

Yes, we all expect a railroad through here and then wood and timber will be worth something.

Henry Peck, of Town 147, Range 36:

I notice a big increase of popular interest.

Charles E. Scott, of Towns 143 and 144, Range 36:

Yes, considerable; the settlers have been more careful about setting fires. I have talked with quite a number of them and tried to make them understand that the timber is a benefit to the settlers as well as to the lumber companies.

Charles R. Wetsel, of Towns 147 and 148, Ranges 32 and 33, (in answer to question 6):

There are a few who oppose the Act on account of their ignorance or a natural inclination to be bull-headed.

## BENTON COUNTY.

W. J. S. Stuart, of Granite Lodge:

I have among settlers, but not with the railroad company.

John Wilson, of St. George:

Yes, not so much burning of brush in the fall when it is dry.

## COOK COUNTY.

John C. Kelly, of Towns 61 and 62, Range 5, West:

In the last two seasons there has been a marked decrease in the number and destructiveness of fires in this county, owing, no doubt, to a general knowledge of the law of 1895.

Claus C. Monker, of Grand Marais:

I do. People are more careful.

H. J. Redmyer, of Towns 58 and 59, Ranges 4 and 5:

It seems that people who explore for minerals are more careful.

## CROW WING COUNTY.

Frank Mills, of Maple Grove:

I do not.

## DOUGLAS COUNTY.

Parnell Atkinson, of Carlos:

I have cautioned parties and instructed them to be very careful when clearing not to let the fire get away from them.

Wm. Knapton, of La Grand:

More respect is paid to the placards this year than last.

## HOUSTON COUNTY.

Thomas Corcoran, of Brownsville:

Yes, some of the taxpayers are very thankful for the Act.

## HUBBARD COUNTY.

M. L. Moore, of Akley:

People seem to respect the law and are more careful than they were before.

R. S. Wagner, of Badoura:

There is an interest in this town.

H. J. Campbell, of Todd:

There seems to be more interest. Have urged the necessity of great care with fire.

C. C. Arnold, of Town 139, Range 33:

Yes, people begin to see that if fires are not kept out it will not be long before they will have to buy coal for fuel.

## ITASCA COUNTY.

A. A. Chase, of Deer River:

No to the first part of the question; to the last of same I have posted the notices furnished by the Chief Fire Warden. The interest manifested has been the tearing down and carrying away or destroying some of these same notices. I think it will be useless to undertake to create a sentiment for forest preservation in localities where the people have forest that they wish destroyed.

S. C. Hooker, of Swan River:

All settlers take an interest in preventing forest fires.

## KANABEC COUNTY.

W. F. Hillman, of Hillman:

Yes.

## LAKE COUNTY.

R. H. Slater, of Beaver Bay:

Yes, by care in clearing land; by explaining the benefits of such a course.

## TODD COUNTY.

W. A. Walker, chairman of town of Moran:

Most settlers take an interest in preventing fires, but not enough to speak of until fire is near them.

## EXTENT OF YOUNG WHITE PINE.

Question 10. To what extent is there a natural growth of young white pines in your township and what is the prospect for the growth of such pines if fires are kept out?

## AITKIN COUNTY.

O. G. Peterson, of Nordland:

A very small portion. The prospect is good for a regrowth.

I. O. Winters, of Town 44, Range 25:

There is some young white pine in Township 44, Ranges 23, 24 and 25.

## BECKER COUNTY.

Charles S. Palmer, of Evergreen:

One thousand acres.

Andrew Bjorkkel, of Green Valley:

Thousands at least.

George Dorman, of Holmesville:

Good.

B. F. Briggs, of Spruce Grove:

Very little.

## BELTRAMI COUNTY.

Robert Dunn, of Town 145, Range 35:

To large extent, and the prospects are good.

Charles Durand, of Red Lake:

I have not seen any young growth of white pine that is worth mentioning.

Albert B. Johnson, of Copley:

Young white pine is spread all over; prospect is good for regrowth if fires could be kept out.

Robert Kittleson, of Towns 148 and 149, Range 30:

All timber in these townships is young and grows very fast.

J. P. Nygaard, of Popple:

I do not think there is any prospect for a regrowth of pine in these towns. What pine there is here is old trees. Have been too many fires here before.

Henry Peck, of Town 147, Range 36:

There are several sections covered with pine running from one foot to 16 feet in height and the prospect for regrowth would be very good if fire is kept out.

Charles E. Scott, of Towns 143 and 144, Range 36:

Jack and Norway pine are coming very rapidly. There is a good prospect for the regrowth of white pine; it does not come as abundantly as the others, but just as thrifty.

## BENTON COUNTY.

J. P. Patock, of Alberta:

Good if fire is kept out.

W. J. S. Stuart, of Granite Ledge:

There is considerable young pine that would be valuable if fires were kept out.

## CARLTON COUNTY.

William Sheils, of Twin Lakes:

Small. Possibly 200 acres; they are now from one to ten feet high.

J. C. Nyhus, of Moose Lake:

There is a small extent of such pines.

## COOK COUNTY.

Chester S. Durfee, of Towns 61 and 62, Range 2, East:

There would probably be in fifty years a growth of the young white pine now growing, about 215,000 feet. The regrowth probably as much if no fires occur.

John C. Kelly, of Towns 61 and 62, Range 5, West:

A very slight extent. According to my observation white pine seldom reproduces itself on the same ground where it has been burned.

Claus C. Monker, of Grand Marais:

Only about 80 acres.

## CROW WING COUNTY.

Joseph Kimball, of Town 138, Range 28:

A good many young pines growing. The regrowth is good if fires are kept out.

## HUBBARD COUNTY.

M. L. Moore, of Akley:

In time there will be a good deal of white pine if fires are kept out.

## ISANTI COUNTY.

Eric Tornberg, of Maple Ridge:

On about three sections on the southern line is a growth of small pines in some places which seem to thrive very well if preserved from fire.

## ITASCA COUNTY.

Alex. Lafrance, of Bass Brook:

If fire is kept out there is a good outlook.

A. A. Chase, of Deer River:

Very little natural growth. For regrowth seed would have to be furnished.

Joseph H. Gardner, of Town 63, Range 23:

It will never amount to much unless the state looks sharp, as the big pine has been cut and the land holder is done with the land. Ninety-nine out of one hundred have disappeared.

Maurice Moore of Town 150, Range 29:

Young pine does not seem to take hold in this country for some reason or other.

Edward E. Moore, of Town 152, Range 29:

Plenty of pine here now, both young and old.

E. R. Lewis, of Ray:

No prospect. The second growth is either Norway or jack pine.

S. C. Hooker, of Swan River:

I have been here seven years. Cannot notice the regrowth of the young pine. Most all land where the pine is cut off is burnt over the following spring.

#### KANABEC COUNTY.

C. P. Larsen, of Arthur:

The prospects are good.

John Keenan, of Comfort:

There is good prospect if fire is kept out.

W. F. Hillman, of Hillman:

There is not much. If the fires were kept out no doubt pine would grow.

#### MILLE LACS COUNTY.

John W. Hall, of South Harbor:

There is very little young growth of white pine, but if fire is kept out a young growth will start in a few years.

Ray Davis, of Town 39, Ranges 26 and 27:

There are many groves or bunches of sapling pine and if fire can be kept out they will be valuable in time.

#### MORRISON COUNTY

C. Cheeley, of Morrill:

There is no very small growth of pine, and hundreds of theives are cutting pine from five inches in diameter up to the largest.

Charles L. Nelson, of Scandia Valley:

Two or three sections [640 acres in a section].

#### PINE COUNTY.

John E. Norstrom, chairman of town of Pokegana:

If vandalism and fires are under control the prospect for regrowth will be good.

## ST. LOUIS COUNTY.

John Gill, chairman of town of Nichols:

There is but little young white pine. If fires are kept down I think it will grow.

James Campbell, chairman of town of Rice Lake:

There is no reason why pine will not grow if fires are prevented.

E. A. Trenholm, of Town 57, Range 16:

Prospect is good if fire is kept out.

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Question 12. Suppose a farmer has ten acres of white pine, whether in one or several patches, standing sufficiently thick, on soil that is unfit for agriculture or for permanent pasture,—in what amount would such body of pine, when ten years old, increase the value of his farm? And please explain the way you arrive at your conclusion.

[NOTE.—The yield tables of Saxony, Germany, show that an acre in fourth-rate locality, fully stocked with Scotch Pine, at the age of ten years contains 2,600 feet, board measure (though of course not merchantable timber); at the age of twenty years, 6,300 feet; at the age of thirty years, 11,100 feet; at the age of forty years, 16,100 feet; at the age of fifty years, 21,400 feet. We thus see that ten acres of such pine on fourth-rate soil would at the age of fifty years contain 214,000 feet. In locality of first quality, a ten-acre tract of such pine at fifty years of age contains 580,000 feet.]

## BECKER COUNTY.

Knud O. Benson, of Lake Eunice:

On a 160-acre farm in this town at least 25 per cent.

## BELTRAMI COUNTY.

Peter Felt, of Town 145, Range 36:

I think most of the farmers would be glad if they had two acres of white pine. I for one would not sell my place for any money. I have a white pine close to the house that is two feet in diameter and about 100 feet high, and it is a daisy.

## BENTON COUNTY.

M. J. Lynch, of Glendorado:

On land only fit for timber the value of the farms would be increased one-fifth.

W. J. S. Stuart, of Granite Ledge:

Probably \$200. I would draw this conclusion from the fact that he would have timber for building purposes on his own land in after years.



## COOK COUNTY.

Chester S. Durfee, of Towns 61 and 62, Range 2 east:

Assuming that the white pine was growing like the Scotch pine, one acre in ten years would give 2,600 feet, then 10 acres would give 26,000 feet, which at \$2 per thousand would increase the farm \$52.

## CROW WING COUNTY.

Frank Mills, of Maple Grove:

A very small amount at the present price of pine.

## DOUGLAS COUNTY.

William Knapton, of La Grand:

In some parts of our township the increase in value would be \$15 to \$20 an acre, in other parts not so much.

## HUBBARD COUNTY.

Chris. Anderson, of Henrietta:

Probably about one-third providing they would do well, but I think there is too little clay and too much sand for white pine to do much of anything in this town.

Dewitt Clason, of Towns 142 and 143, Range 35:

It would double itself every 10 or 15 years—I mean the growth.

## KANABEC COUNTY.

John Keenan, of Comfort:

First shelter for the stock. Evergreen attracts the eye of the traveler. I would give \$500 for 10 acres of evergreen five years old if it was on my farm.

John Bengtson, of South Fork:

Such a ten-acre patch, or smaller patches, would be worth more than the timber itself is worth simply because it gives such a nice appearance around buildings. I for my part would call it worth from \$500 to \$1,000.

## MILLE LACS COUNTY.

John Dalchow, of Bogus Brook:

About \$5 an acre.

J. F. Bockoven, of Princeton:

Am satisfied that in this locality it would increase the value one-fifth.

## MORRISON COUNTY.

A. Lund, of Cushing:

About \$150, of which \$75 for timber and balance in windbreak and general improvement.

John Brown, of Parker:

I have considerable white pine on my place, but I can't see that it grows very much and I am here 18 years. There is no pine in this town now for lumber. Last summer there were parties going through the woods cutting everything that would make a tie.

E. S. Hall, chairman of town of Clough:

I think it would increase the value to the amount of \$550. I have lived in a grove of white pine for 7 years and I know they have doubled their size in that time.

#### OTTER TAIL COUNTY.

Wm. Zimmer, chairman of town of Carlisle:

Would increase the value of a farm for windbreaks.

F. C. Cole, chairman of town of Homestead:

It would increase the value of the farm more in appearance than in the value of the pine.

#### PINE COUNTY.

John E. Norstrom, chairman of town of Pokegana:

At least \$500 to \$600.

#### TODD COUNTY.

John Dussault, chairman of town of Fawn Lake:

For a farmer it would amount to nothing. I would not have it on the place.

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Question 20. Please state any other fact that you think may help the cause of forest preservation.

#### AITKIN COUNTY.

I. O. Winters, of Malmo:

I think fire wardens should be paid for looking over their towns to see if there is fire or has been. I have spent 18 days in looking over my towns for which I get nothing.

#### BECKER COUNTY.

Emanuel Berg, of Lake Park:

Require those who cut down pine to replant an equal area.

#### BELTRAMI COUNTY.

Alex. Maule, Towns 148 and 149, Ranges 31 and 32:

There are lots of meadow uncut last year, the dead grass is very heavy and if fire gets in during a dry spell and high wind it would be dangerous because there is much down balsam and poplar all through the standing timber, with other brush and leaves.

#### BENTON COUNTY.

Martin Herman, of Gilmanton:

The railroad company does not keep its right of way sufficiently clear of grass and rubbish.

W. J. S. Stuart, of Granite Ledge:

To see that the railroad strictly complies with the law. Some of the worst fires we have had were started by them.

## COOK COUNTY.

John C. Kelly, of Towns 61 and 62, Range 5 west:

I think that most fire wardens are too indifferent about enforcing that section of the law relating to the use of incombustible wads in firearms and in reporting small fires caused by them.

George Wartner, of Gunflint Lake:

The forest fires of 1893 and 1894 destroyed about one hundred million feet of good pine in Townships 64, Ranges 3 and 4; 65, Ranges 3 and 4.

## HUBBARD COUNTY.

E. R. Hinds, of Hubbard:

I think each town ought to be allowed so much for fire wardens and there would be no trouble about getting their pay, because some want big pay and some do not charge anything.

## ISANTI COUNTY.

J. H. Chapman, of Spencer Brook:

Execute the present law and encourage tree planting.

## ITASCA COUNTY.

A. A. Chase, of Deer River:

Through all classes of timber here are immense quantities of balsam, or fir, and what applies to this town applies to the whole of the organized town, only in the other parts of the organization the pine is practically all cut. One thing is morally certain, and that is, if a fire gets started in a dry time the country round about here will get a tremendous scorching and fire wardens, with all the force they can muster, will be powerless to arrest or control it.

The situation is far more critical since July 3d last when a large scope of country was visited by a high wind assuming almost the proportions of a tornado that prostrated a large quantity of timber. In places it is practically impassable for man or beast. The fires of two, three and four years previous had killed a large percentage of the timber, which made the destruction the easier and more complete.

Joseph H. Gardner, of Town 63, Range 23:

The state to help put good roads through the county so that people could travel. People would stay on the road where they could find shelter, and it would settle up the country. By making more clearings it would lessen the danger.

E. R. Lewis, of Ray:

I can only state that the Indians, many of whom do not live on their reservations, are the greatest cause of the destruction of timber both by setting fires and stripping the bark from the best cedar, birch and tamarack. It would not be so bad if they did not come over from the reservations on the Canadian side to get their canoe bark. In fact I cannot go into any grove of brifty timber but I find the best trees have been killed in this way.

## KANABEC COUNTY.

John Bengtson, of South Fork:

Most of the timber in this town is dry, and during the last year much grass has grown up and if fire comes it will be hard to prevent it and few people to fight it. Furthermore, many settlers are coming in here who have much work to do on the start and do not get time to clear around buildings as they should. In case our town becomes the victim of forest fires without doubt many settlers will be burnt out.

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DAMAGE CAUSED BY FOREST FIRES IN MINNESOTA PREVIOUS  
TO 1895.

In answer to the question, "What, for a rough estimate, do you consider the amount of damage which, previous to the year 1895, has been done in your township (if more than one township, state as to each township) by forest fires, and give some of the facts which support your conclusion?" several failed to give any estimate, but the aggregate estimates of seventy-five fire wardens amount to \$4,232,000 as the amount of damage which had been caused by forest fires previous to the year 1895.

## PROGRESS OF NEW SETTLEMENTS.

The permanent location of new settlers in the forest regions increases the danger from fires. The severe business depression which has so long prevailed in the larger cities has, among other causes, sent many families out upon the public and other vacant lands where unquestionably in most cases their prosperity will be promoted. An industrious and frugal family with a snug log house, a cow, a pig, some fowls and even a small patch of ground under cultivation, if not too far from a main route of travel, can subsist and gradually improve their condition, feeling all the time the happiness of independence.

In reply to the question, "To what extent are new settlers coming into your town to locate permanently?" the answers from thirty-two towns showed an average of a little over twenty-three families, or new settlers, annually locating in each town.

## PASSABLE WAGON ROADS.

Good roads form an important break against the spread of forest fires. To obtain some idea of the situation in respect to roads the following question (No. 18) was submitted: "How many miles of passable natural or artificial wagon road are there in your town, and where situated, and about how much is expended annually for its maintenance?" Replies from 138 chairmen in organized towns and fire wardens in unorganized towns show an aggregate of 5,493 miles, or 40 miles per town, and an aggregate amount of \$64,795 annually expended for their maintenance.

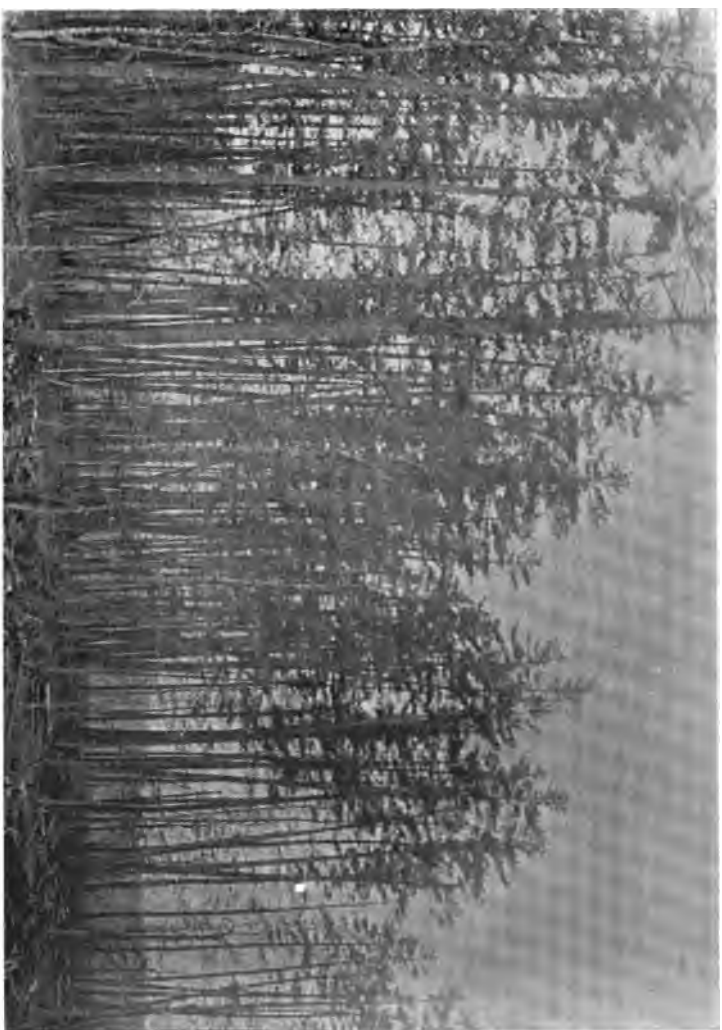
## LAND ONLY FIT FOR BEARING PINE.

Replies from fire wardens in seventy-five towns reported an aggregate of 600,000 acres only fit for bearing pine. A majority reported that all the land in their towns was suitable for agriculture.

I passed over a part of the Red Lake Indian Reservation last October, via Fosston to Red Lake, returning by a route lying a little west, and was disappointed in seeing so much poor country. I passed through one fine body of primeval white pine which appeared to occupy the best soil—namely, a clayey loam,—also a few good bodies of hard wood. The surface of the country, which is moderately undulating, is mostly covered with a light growth of poplar and well watered, but as to the land generally, I would say that three-fourths of it is better suited for forest than for agriculture. There is no question that there are several million acres of waste land in Northern Minnesota that is only fit for bearing forest, and the sooner it becomes utilized for that purpose the richer will be our state.

## AMOUNT OF STANDING TIMBER IN MINNESOTA.

In my report of last year I furnished a conservative estimate of the amounts and varieties of standing timber in the state. From additional information which I have received from competent judges I am induced to raise the estimates as to white pine in three counties, namely, in Cass county



STAND OF MINNESOTA WHITE PINE ABOUT 100 YEARS OLD, ON THE BLACK HOOF RIVER.



from 1,600,000,000 feet to 2,500,000,000, being an increase of 900,000,000 feet; in Cook county from 800,000,000 feet to 2,000,000,000, being an increase of 1,200,000,000 feet, and in Lake county from 1,500,000,000 to 2,000,000,000, being an increase of 500,000,000; being altogether an increase of 2,600,000,000 feet, making the sum total of standing white pine in the state 16,849,000,000 feet, and of Norway pine (the estimate of which I have not changed) 3,417,475,000 feet, making in the aggregate for both kinds 20,261,475,000 feet. With these amendments inserted I shall quote in this report here below the estimates of standing timber given in last year's report.

Mr. C. A. Smith, of the C. A. Smith Lumber Company, Minneapolis, in an interview which I had with him, recently repeated to me his confident opinion and estimate, which, by request, he gave a few months ago in Washington, that the standing white and Norway pine together in Minnesota amounts to forty billion feet. This he gives as a rough estimate. His company has expended \$75,000 in looking over the pine country, having had at one period thirty men in the field for a year and a half. His opinion is based much on the judgment of others and on the common fact that land reported cut clean afterwards is found to yield considerable timber. Mr. Smith remembers hearing leading lumbermen in 1870 express the opinion that in ten or twelve years all the pine tributary to the Mississippi river would be exhausted.

Captain J. M. Paine, of Carlton, who has had forty years' experience in lumbering in Minnesota, is of the opinion that, under present conditions, as much pine will yet be cut in this state as has already been cut. The reason he gives for this is that lumbermen now cut very clean and that about fifty per cent of what they cut is what in former years would have been rejected or left uncut.

It is altogether probable that thirty billion feet of pine has been cut in Minnesota during the past fifty years; and if an equal amount still remains then the present value of the standing pine in the state is ninety million dollars.



THE MINNESOTA FORESTS AND AMOUNTS AND VARIETIES OF  
THE WOOD AND TIMBER GROWING THEREIN.

Section 3 of the Forest Preservation Act makes it the duty of the Chief Fire Warden to "investigate the extent of the forests of the state, together with the amounts and varieties of the wood and timber growing therein," and to include such information in his annual report. This is a very important and interesting work, but to do it thoroughly would require much time and means to employ competent persons to make an actual examination of the timber in the woods. Of course no such means have yet been provided and all the information that can now be furnished as to the extent of the forests and the amount and varieties of timber growing therein is a conservative estimate, based, in part, upon information received from many owners of timber land, from some examination of plats and field notes of the public surveyors, from estimates of fire wardens, from consultations and correspondence with timber land experts, and from a little personal acquaintance with the Minnesota forests gained by visits during the past forty years.

One would suppose that the "field notes" of the public surveyors would give a good clue to the amount of timber, but they do not. They are merely remarks of what the surveyor observed in hastily passing, not through, but along the four sides of each square mile of land. In some surveys these remarks have been omitted, and as very much of the surveyed land has been lumbered for many years the "field notes" form but a slight basis on which to determine the present amount of timber. \* \* \* \* \*

What is considered a rough but conservative estimate of the extent of the forests and amount of timber therein is now submitted by (timber) counties in their alphabetical order, but subject to such corrections as shall be found proper after further investigations. The estimates of wood will be on the basis, as a rule, that forests of mixed timber will average ten cords of wood per acre, in addition to the merchantable timber. All persons who discover errors in the estimates are earnestly desired to communicate corrections to this office. Doubtless it will often happen that some merchantable tamarack, spruce, and poplar will be classed as wood.

The statements of area of land are exclusive of water. In estimates of timber board measure is understood.

AITKIN COUNTY.

The Mississippi river flows diagonally across this county, and Mille Lacs Lake forms a part of its southern boundary. It was originally covered with mixed timber. The Northern Pacific Railroad has been in operation across its central part for twenty years. Two other rail-

roads touch its northern line. The facilities for getting out the pine have been good, and nearly all of it has been removed. The most that remains is in the three or four northwestern townships and in those bordering Mille Lacs Lake. The bottom lands of the Mississippi contain elm, maple, oak, and other large-leaved timber. The supply of elm has led to the recent establishment of a stave and hoop factory at the town of Aitkin. At the present time 50,000,000 feet of pine are being cut annually in the county, of which half is cut by homestead settlers.

Land (acres).....	1,000,000
Forest (acres).....	300,000
White pine (feet).....	375,000,000
Norway (or red) pine (feet).....	75,000,000
Elm (feet).....	1,000,000
Oak, ash, birch, basswood, butternut, etc. (feet).....	3,000,500
Wood (cords).....	3,000,000

#### BECKER COUNTY.

The beautiful hardwood forest that skirts many of the lakes in this county has made them favorite summer resorts, especially for people from Fargo and other places in North Dakota, many of whom have cottages on their shores.

Land (acres).....	836,000
Forest (acres).....	240,000
White pine (feet).....	120,000,000
Norway pine (feet).....	60,000,000
Oak (feet).....	12,000,000
Ash, elm, basswood, birch, poplar, spruce, tamarack, etc. (feet).....	10,000,000
Wood (cords).....	2,000,000

#### BELTRAMI COUNTY.

This county is remarkable, both for its great extent and for containing the magnificent body of virgin pine forest, situated on the Red Lake Indian Reservation and principally south and east of the lake. Pine is found on the higher ground all the way to the northern boundary.

Land (acres).....	2,750,000
Forest (acres).....	1,650,000
White pine (feet).....	1,500,000,000
Norway pine (feet).....	350,000,000
Oak, maple, birch, spruce, poplar, tamarack, etc. (feet)	250,000,000
Wood (cords).....	16,500,000

## BENTON COUNTY.

Land (acres).....	357,000
Forest (acres).....	89,000
White pine (feet) .....	1,000,000
White and red oak (feet).....	6,000,000
Black ash (feet).....	4,000,000
Basswood (feet).....	3,000,000
Common elm (feet).....	5,000,000
Wood (cords).....	1,335,000

## CASS COUNTY.

This county contains very rich forests of pine and hardwood around Cass, Leech and Winnibigoshish lakes. The land immediately south of Leech Lake, to the width of ten miles, is a fine undulating country with good clay and loam soil covered with heavy white pine mixed with some hardwood. The Brainerd & Minnesota Northern Railroad now penetrates this country as far as Walker, situated on one of the west arms of Leech Lake, and has branches winding round to a dozen or more lumber camps. The quantity of pine now yearly taken out by this railroad runs up into the hundreds of millions of feet.

Land (acres).....	1,500,000
Forest (acres).....	600,000
White pine (feet).....	2,500,000,000
Norway pine (feet).....	400,000,000
Oak (feet).....	8,000,000
Ash, birch, basswood, elm, etc. (feet).....	25,000,000
Wood (cords).....	6,000,000

## CARLTON COUNTY.

Originally this county was probably more heavily timbered with pine than any other county in the state. Situated near Lake Superior and crossed by four railroads, the facilities for marketing the pine have been good, and it is estimated that nearly 3,000,000,000 feet have been cut. The principal amount remaining is in the eastern townships. Around Barker station is yet standing a very considerable body of pine in its primeval grandeur. There is an authentic instance in this county of an acre of white pine yielding, from actual measurement, upward of 100,000 feet, board measure. As the average value of standing pine is \$3 per 1,000 feet, such an acre of pine would be worth at least \$300.

Land (acres).....	548,000
Forest (acres).....	300,000
White pine (feet).....	550,000,000
Norway pine (feet).....	100,000,000
Oak (feet).....	15,000,000

Cedar (feet).....	10,000,000
Yellow birch (feet).....	10,000,000
Maple, basswood, spruce, poplar, etc. (feet).....	10,000,000
White ash (feet).....	100,000
Wood (cords).....	3,000,000

## COOK COUNTY.

Land (acres).....	900,000
Forest (acres).....	600,000
White pine (feet).....	2,000,000,000
Norway pine (feet).....	150,000,000
Cedar (feet).....	200,000,000
Spruce (feet).....	200,000,000
Birch, oak, maple, poplar, etc. (feet).....	100,000,000
Wood (cords).....	9,000,000

## CROW WING COUNTY.

Land (acres).....	527,000
Forest (acres).....	140,000
White pine (feet).....	25,000,000
Norway pine (feet).....	5,000,000
Gray or jack pine (feet).....	10,000,000
White and red oak (feet).....	4,000,000
Ash, birch, maple, etc. (feet).....	2,000,000
Wood (cords).....	1,400,000

## DOUGLAS COUNTY.

Land (acres).....	400,000
Forest (acres).....	85,000
White and red oak (feet).....	10,000,000
Ash, maple, elm, basswood, spruce, etc. (feet).....	10,000,000
Wood (cords).....	4,000,000

## HUBBARD COUNTY.

Land (acres).....	550,000
Forest (acres).....	330,000
White pine (feet).....	450,000,000
Norway pine (feet).....	300,000,000
Gray or jack pine (feet).....	50,000,000
Oak (feet).....	3,000,000
Birch (feet).....	10,000,000
Spruce, poplar, etc. (feet).....	10,000,000
Wood (cords).....	3,300,000

## ISANTI COUNTY.

Land (acres).....	266,000
Forest (acres).....	50,000
White pine (feet).....	200,000
White and red oak (feet).....	2,000,000
White and black ash (feet).....	1,000,000
Maple, basswood, etc. (feet).....	1,000,000
Wood (cords).....	500,000

## ITASCA COUNTY.

This county, although not all surveyed, contains about 170 full congressional townships, and when settled will form an important part of the state. Reports from the fire wardens representing twenty-six congressional townships in this county show, according to their estimates, an aggregate amount of 417,000,000 feet of white pine and 358,000,000 feet of Norway pine, or together 775,000,000 feet, which will average about 30,000,000 feet per township. Assuming that all the townships in the county will average an equal amount, which is hardly probable, it would show that the total amount in the county is 5,000,000,000 feet. A safer estimate would probably be about half of that. Two important rivers, the Big Fork and the Little Fork, flow north through this county, and it is an interesting fact that the Little Fork is the larger of the two. With reference to the timber in the country watered by these streams, Mr. Horace V. Winchell, in his report of geological observations, made in the summer of 1887, says: "A large area of the land traversed by the Big Fork and Little Fork rivers is within the limits of the glacial lake, Agassiz. This region is now covered with a fine growth of timber, both hard and soft wood, and is excellent farming land. It is slightly rolling, or else flat, and well watered by these large rivers and their numerous tributaries. Much of the pine that stood within a few years along these streams has been stolen and floated down to Lake of the Woods. This unlawful destruction of some of the finest of our Minnesota pine seems to be carried on every winter, as many of the logs, freshly cut, still lie around."

Also, the report of 1895, on the Rainy Lake gold region, by Messrs. H. V. Winchell and U. S. Grant, of the Minnesota Geological and Natural History Survey, states, and the remarks apply in part to St. Louis county:

"The usual white and Norway pines are found throughout this entire region, but not always of sufficient size to pay for cutting. Yet there are many places along the shores of Rainy Lake and the adjoining bodies of water where there are groves of good-sized pines; and many scattered areas of timber exist in the vicinity of the Big Fork and Little Fork rivers. Some of the pine has already been cut and taken to Rat Portage, but much remains to be cut as soon as the demand for lumber in this district increases. A saw mill was in operation near Rainy Lake City during the last summer and two or three others on Rainy river.

"In hardwood timber the white birch, which occurs throughout the region, and which often reaches a size suitable for lumber, may be mentioned; oak and elm of good size occur in the flat, clayey district just to the west of Rainy Lake.

"The numerous swampy tracts of this part of the state are often covered by a dense growth of excellent spruce timber. This is used in large amounts in the manufacture of pulp and paper, and as the more southern regions are being rapidly devastated of their timber, the spruce of Northern Minnesota will soon become exceedingly valuable. Growing, as it does, in the lower and damper grounds, it is not so subject to destruction by forest fires as the pine."

Land (acres).....	3,600,000
Forest (acres).....	2,000,000
White pine (feet).....	2,200,000,000
Norway pine (feet).....	550,000,000
Gray or jack pine (feet).....	30,000,000
Cedar (feet).....	100,000,000
Spruce (feet).....	100,000,000
Tamarack (feet).....	50,000,000
Birch (feet).....	100,000,000
Oak (feet).....	50,000,000
Basswood, maple, elm, ash, poplar, etc. (feet).....	100,000,000
Wood (cords).....	36,000,000

## KANABEC COUNTY.

Land (acres).....	337,000
Forest (acres).....	200,000
White pine (feet).....	150,000,000
Oak (feet).....	50,000,000
Birch (feet).....	5,000,000
Poplar (feet).....	40,000,000
Ash, maple, basswood, elm, etc. (feet).....	10,000,000
Wood (cords).....	4,000,000

## LAKE COUNTY.

Land (acres).....	1,328,000
Forest (acres).....	900,000
White pine (feet).....	2,000,000,000
Norway pine (feet).....	200,000,000
Gray pine (feet).....	50,000,000
Cedar (feet).....	400,000,000
Yellow birch (feet).....	150,000,000
Maple (feet).....	50,000,000
Spruce (feet).....	200,000,000
Tamarack, poplar, etc. (feet).....	150,000,000
Wood (cords).....	9,000,000

## MILLE LACS COUNTY.

Lumbering has been carried on in this and in the county of Kanabec for forty years, and over a billion feet of excellent white pine has been taken out of each county. A heavy and splendid forest of origi-

nal growth of white pine on undulating surface now covers the south shore of Mille Lacs lake, but is being rapidly cut.

Land (acres).....	365,000
Forest (acres).....	260,000
White pine (feet).....	500,000,000
Norway pine (feet).....	40,000,000
White oak (feet).....	30,000,000
Red oak (feet).....	30,000,000
White ash (feet).....	10,000,000
Black ash (feet).....	10,000,000
Birch, elm, basswood, maple, tamarack, poplar, etc. (feet)	30,000,000
Wood (cords).....	3,000,000

#### MORRISON COUNTY.

There was pine lumbering on Platte river in this county upward of forty years ago, and has been carried on continuously ever since, but the supply of pine is about exhausted.

Land (acres).....	693,000
Forest (acres).....	300,000
White pine (feet).....	18,000,000
Norway pine (feet).....	7,000,000
Oak (feet).....	30,000,000
Birch (feet).....	6,000,000
Poplar (feet).....	20,000,000
Ash (feet).....	3,000,000
Basswood, elm, maple, poplar, etc. (feet).....	25,000,000
Wood (cords).....	3,000,000

#### OTTER TAIL COUNTY.

Land (acres).....	1,270,000
Forest (acres).....	300,000
White pine (feet).....	2,000,000
Norway pine (feet).....	400,000
Oak (feet).....	50,000,000
Ash (feet).....	25,000,000
Birch (feet).....	10,000,000
Maple, elm, basswood, spruce, poplar, etc. (feet).....	40,000,000
Wood (cords).....	3,000,000

#### PINE COUNTY.

Land (acres).....	900,000
Forest (acres).....	300,000
White pine (feet).....	800,000,000
Norway pine (feet).....	300,000,000
Oak (feet).....	100,000,000
Ash (feet).....	40,000,000
Basswood (feet).....	50,000,000
Birch, maple, elm, poplar, tamarack, etc. (feet).....	60,000,000
Wood (cords).....	3,000,000

## ROSEAU COUNTY.

Land (acres).....	865,000
Forest (acres).....	260,000
White pine (feet).....	450,000,000
Norway pine (feet).....	150,000,000
Spruce (feet).....	100,000,000
Oak (feet).....	50,000,000
Ash, basswood, birch, maple, tamarack, etc. (feet).....	50,000,000
Wood (cords).....	2,600,000

## ST. LOUIS COUNTY.

This county has an extent of 100 miles north and south by sixty miles east and west, and is a little empire in itself. It is natural forest, also contains the principal iron mines in Minnesota that have as yet been developed, and in the midst of which several large villages have grown up. Finely watered, with fertile soil and favorable surface this superb county is destined to have a large population. There are about 200 congressional townships in its limits. Of these, a very few have not been surveyed. There are but a very few, if any, townships which do not contain some pine timber. The "field notes" of the public surveyors in different years back show that as many as thirty-one townships had suffered seriously from forest fires. In some instances whole townships had been devastated of their splendid pine, and in its place was springing up thick growths of poplar. The county is traversed by four railroads. A great deal of pine has been cut and shipped from the lake ports. Reports of fire wardens, for the most part acquainted with timber, representing thirty congressional townships, show an aggregate in these towns of 620,000,000 feet of white pine and 270,000,000 feet of Norway pine, or, together, 890,000,000 feet. Assuming that each of the towns would average 30,000,000 feet, the total amount for the whole county, including white and Norway pine, would be 6,000,000,000 feet. But this would hardly be a conservative estimate. It is true there are some remote unsettled townships that are heavily timbered with pine. So, there are some which are principally covered with jack (gray) pine (which, however, is used for shingles and fuel) and some almost wholly swamp. It would not be surprising if a thorough examination would show fully 5,000,000,000 feet of standing pine in the county, but in the absence of accurate information the only safe way is to make a smaller estimate. The pine is found generally mixed with other varieties of timber.

The estimate of forest area, as in the foregoing estimates, is intended to include only actual forest and to exclude brush land and tamarack swamps.



Land (acres).....	2,091,000
Forest (acres).....	1,500,000
White pine (feet).....	3,200,000,000
Norway pine (feet) .....	700,000,000
Gray pine (feet) .....	400,000,000
Spruce (feet).....	450,000,000
Cedar (feet).....	300,000,000
Birch (feet).....	400,000,000
Ash (feet).....	200,000,000
Oak (feet) .....	400,000,000
Basswood (feet). ....	400,000,000
Elm (feet).....	200,000,000
Maple (feet).....	100,000,000
Poplar (feet) .....	400,000,000
Tamarack (feet).....	400,000,000
Wood (cords).....	15,000,000

#### STEARNS COUNTY.

This county, though prairie in the western part, formerly contained a large continuous forest of hardwood, interspersed with beautiful lakes, but began to be settled up as early as 1856. Several mills for the consumption of hardwood timber have been in operation for many years. It is a peculiar fact that a cluster of original white pines is standing in the city of St. Cloud; and from thence north on the west bank of the Mississippi will be found occasional pines, as if thrown out as pickets from the great pine forest.

Land (acres).....	800,000
Forest (acres).....	85,000
Oak (feet).....	5,000,000
Basswood (feet).....	8,000,000
Ash (feet).....	3,000,000
Maple (feet).....	3,000,000
Birch, butternut, elm, poplar, etc. (feet).....	5,000,000
Wood (cords).....	850,000

#### TODD COUNTY.

This, though largely a forest county, has been settled for many years. A recent letter from the auditor of the county states: "The quantity of oak and other timber suitable for railroad ties is being diminished at a very rapid rate, and small portable saw mills are using up nearly every kind of timber growing in this region." The same remark will apply to several other counties.

Land (acres).....	618,000
Forest (acres).....	300,000
White pine (feet) .....	2,000,000
Norway pine (feet) ...	75,000
Oak (feet).....	25,000,000

Ash (feet).....	20,000,000
Maple (feet).....	15,000,000
Elm (feet).....	10,000,000
Basswood (feet).....	30,000,000
Birch (feet).....	10,000,000
Poplar, tamarack, etc. (feet).....	20,000,000
Wood (cords).....	3,000,000

## WADENA COUNTY.

Land (acres).....	452,000
Forest (acres).....	100,000
White pine (feet).....	6,000,000
Norway pine (feet).....	30,000,000
Gray or jack pine (feet).....	100,000,000
Oak (feet).....	20,000,000
Ash (feet).....	10,000,000
Birch (feet).....	5,000,000
Maple (feet).....	10,000,000
Poplar (feet).....	15,000,000
Wood (cords).....	1,000,000

## SUMMARY.

The estimates for the foregoing twenty-three forest counties foot up as follows:

Land (acres).....	22,855,000
Forest (acres).....	10,889,000
White pine (feet).....	16,849,000,000
Norway (or red) pine (feet).....	3,417,475,000
Gray (or jack) pine (feet).....	640,000,000
Ash (feet).....	126,100,000
Basswood (feet).....	491,000,000
Birch (feet).....	706,000,000
Cedar (feet).....	1,010,500,000
Elm (feet).....	216,000,000
Maple (feet).....	178,000,000
Oak (feet).....	700,000,000
Poplar (feet).....	475,000,000
Spruce (feet).....	1,050,000,000
Tamarack (feet).....	450,000,000
Ash, basswood, butternut, birch, elm, maple, poplar, spruce, tamarack, etc., not included in separate esti- mates (feet).....	911,500,000
Wood (cords).....	97,480,000

The estimates of the auditors of twenty-nine other counties, which contain more or less hardwood forest, show an aggregate area of 656,000 acres of natural forest, containing 6,000,000 cords of wood; also 45,000 acres of artificial forest, containing 67,000 cords of wood. Twenty-seven other counties, of which some are the oldest settled and some are

mostly prairie, may be estimated as aggregating 345,000 acres of natural forest, with 3,450,000 cords of wood; also, aggregating 15,000 acres of artificial forest. The total area of natural forest in the state, according to the foregoing figures, and not including mere brush and swamp land, is 11,890,000 acres.

It is estimated that the natural growth of timber, in rather thick and high forest, averages about one-third of a cord per acre, being, for that portion that could be regarded as merchantable timber, equivalent to about 400 feet, board measure, per acre. From this it can be seen what Nature tries to do, and if the forests were protected, would do, to repair the waste and consumption by man.

#### THE LOGGING INDUSTRY.—OPINIONS OF LUMBERMEN.

The following answers, lately received from prominent lumbermen, are not only suggestive of the industrial importance to our state of the logging business,—furnishing as it does wages to thousands of workingmen in the winter months,—but also present interesting views in regard to the regrowth of white pine.

The Shevlin Lumber Company of Minneapolis have known the same pine land to be cut over three times, which undoubtedly agrees with the experience of most lumbermen in the St. Croix and Rum River valleys. Considerable pine land has been cut over more than three times.

Mr. Edwin St. John, of Stillwater, states: "I have cut over the same land from three to six times in fifteen years' time." On the other hand, Mr. Frey, of the Nelson-Tenney Lumber Company of Minneapolis, states: "When land was cut clean the first time I have never known of any pine growing on it afterwards."

Mr. St. John thinks it would be a good idea to burn up the tree tops; and several others appear to agree with him. All are very emphatic as to the importance of preventing forest fires. Mr. Merrill, of Merrill & Ring, Duluth, thinks the present fire protection inadequate. Perhaps it is, but who is there yet willing to incur the expense of a better system?

With regard to the burning of slashings (tops and branches of pines) I lately passed over a section of land on the Black Hoof river in Carlton county where an uncommonly heavy body of primeval white pine was cut clean the past winter by Messrs. Mitchell and McClure. The black and charred appearance of the huge stumps and even of the ground itself showed there had been recent fire; and Mr. John McNulta, foreman of the camp, informed me that the slashings were consumed by fire in April last while they were still logging and while a plenty of men were present to assist in controlling the fire. The fires were set, he said, at different times when the wind and weather were favorable, and he thought the whole expense of burning the slashings did not exceed ten cents per acre, which certainly is very much less than many lumbermen have claimed as the supposed cost of such work.

The question as to the policy of burning the slashings seems to be an open one. There were no trees left on this cut-over ground for future seeding, and Mr. H. B. Ayers, who accompanied me on the trip, expressed doubt whether young pine would ever again appear on the land. Mr. McNulta, however, from his experience in similar cases in Michigan, was of the opinion that it would. If lumbermen, fire wardens or any persons who are interested in forestry will watch such land we will in a few years have more information on the subject.

## STATEMENT OF MERRILL &amp; RING.

1. How many years have you been engaged in the logging business in Minnesota?

Answer. Five years.

2. In what county or counties do you operate? and are you cutting on your own land, or as a contractor on land of others?

Answer. In St. Louis the present winter.

3. Average number of hands usually employed by you in a season, in camps, under your exclusive control?

Answer.....

4. Average wages paid per month including board?

Answer. Twenty-five to thirty dollars.

5. Usual length of the season they are so employed?

Answer. Six months.

6. Number of draft animals used?

Answer.....

7. Average annual amount expended by you for supplies, being products of agriculture, including live stock?

Answer.....

8. If there is improvement in the method of logging over what was the practice twenty-five or thirty years ago, please explain wherein?

Answer.....

9. Please explain the leading features of the business as now conducted?

Answer.....

10. What are the principal drawbacks and risks in the business and how, if in any way, can they be remedied?

Answer.....

11. How many times have you known the same pine land to be cut over and at what number of years interval?

Answer. Have never known of new growth of pine being cut in the Northwestern states.

12. How do you account for pine not growing on land that has been cleared of pine?

Answer. Want of systematic adequate fire protection, lack of organization for the purpose, and an entire misconception by the public and all concerned of the object to be attained.

13. What, if any, economical way is there for maintaining the re-growth of white pine and preserving a permanent supply?

Answer. This information may be best obtained by observa-tion and imitation of methods pursued by other countries experienced in forest culture.

14. How long will the supply of white pine last if lumbering con-tinues as at present?

Answer.....

15. On what kind of soil and surface have you found the best white pine?

Answer.....

16. About how many pine trees in a hundred do you find to be worthless from being over-ripe or too old?

Answer.....

17. About how many pine trees do you find to be worthless from other, and what, causes?

Answer.....

18. Can you recommend any practical way for preventing such loss of trees?

Answer.....

19. What are the dangers and injuries that pine forests are most liable to; and please state fully the best means for their prevention?

Answer.....

20. To what extent have the pine forests been injured by fires in years past and how have such fires originated, so far as you know and believe?

Answer. ....

21. If you consider it practicable to burn the tree branches and tops left in lumbering, what is the best method of doing so?

Answer. This is likely to meet with opposition by owners on account of expense which, having never been contemplated, would be seriously felt by operators whose profits are already small. If undertaken it should be under the supervision of the state and partly at its expense. It no doubt would be a great benefit and save a large amount of timber.

22. State any other facts that you think may be useful?

Answer.....

[Signature] C. L. RING, Trustee,  
per M. D. MERRILL.

[Place and date] Duluth, March 22, 1897.

## STATEMENT OF EDWIN ST. JOHN.

1. How many years have you been engaged in the logging business in Minnesota?

Answer. Twenty-two years.

2. In what county or counties do you operate? and are you cutting on your own land, or as a contractor on land of others?

Answer. Kanabec county and Pine county, Minn. On  $\frac{1}{2}$  of my own lands, balance on contract lands.

3. Average number of hands usually employed by you in a season, in camps, under your exclusive control?

Answer. Three hundred men.

4. Average wages paid per month including board?

Answer. Twenty-six dollars per month.

5. Usual length of the season they are so employed?

Answer. Six months.

6. Number of draft animals used.

Answer. One hundred and twenty head.

7. Average annual amount expended by you for supplies, being products of agriculture, including live stock?

Answer. Twelve thousand five hundred dollars.

8. If there is improvement in the method of logging over what was the practice twenty-five or thirty years ago, please explain wherein?

Answer. In making good logging roads, sawing down trees, rockers on both sleds, water tanks, rut cutters, snowplow, stove in water tank.

9. Please explain the leading features of the business as now conducted?

Answer. Making good logging roads and skid your logs well.

10. What are the principal drawbacks and risks in the business and how, if in any way, can they be remedied?

Answer. Snow coming early in the fall which prevents the ground from freezing, and when this happens snowplow the logging roads, cut very wide, say twenty feet on each side of the logging road, wider than the road is.

11. How many times have you known the same pine land to be cut over and at what number of years interval?

Answer. I have cut over the same land from three to six times in fifteen years' time.

12. How do you account for pine not growing on land that has been cleared of pine?

Answer. I have always seen pine growing on lands that I have cut over.

13. What, if any, economical way is there for maintaining the regrowth of white pine and preserving a permanent supply?

Answer. Keep fires out.

14. How long will the supply of white pine last if lumbering continues as at present?

Answer. Five years on St. Croix and its tributaries.

15. On what kind of soil and surface have you found the best white pine?

Answer. Black loam and clay.

16. About how many pine trees in a hundred do you find to be worthless from being over-ripe or too old?

Answer. Five trees.

17. About how many pine trees do you find to be worthless from other and what causes?

Answer. Five. Dying roots being disturbed and fire killing the roots and woodpecker gets to pecking them.

18. Can you recommend any practical way for preventing such loss of trees?

Answer. Keep fires from being started in the timber.

19. What are the dangers and injuries that pine forests are most liable to; and please state fully the best means for their prevention?

Answer. Fires.

20. To what extent have the pine forests been injured by fires in years past and how have such fires originated, as far as you know and believe?

Answer. Ten to twenty per cent. By men exploring and careless in leaving a campfire, and I think there has been lots of fires started on purpose to burn up limbs.

21. If you consider it practicable to burn the tree branches and tops left in lumbering, what is the best method of doing so?

Answer. I never have burnt the tree tops, but I think it a good idea to burn up the tree tops.

22. State any other facts that you think may be useful?

Answer. Appoint more deputies and enforce the laws, and make an example of a few that set out fires and some that do it for a business.

[Signature.] EDWIN ST. JOHN.

[Place and date.] Stillwater, Minn., March 24, 1897.



## STATEMENT OF THE SHEVLIN-CARPENTER LUMBER COMPANY.

1. How many years have you been engaged in the logging business in Minnesota?

Answer. Twenty years.

2. In what county or counties do you operate? and are you cutting on your own land, or as a contractor on land of others?

Answer. Itasca, St. Louis, Cass. Our own.

3. Average number of hands usually employed by you in a season in camps, under your exclusive control?

Answer. Fifty.

4. Average wages paid per month including board?

Answer. Eighteen dollars.

5. Usual length of the season they are so employed?

Answer. Four months.

6. Number of draft animals used?

Answer. Thirty-two.

7. Average annual amount expended by you for supplies, being products of agriculture, including live stock?

Answer. Three thousand dollars.

8. If there is improvement in the method of logging over what was the practice twenty-five or thirty years ago, please explain wherein?

Answer. In every way. Make better roads, use better horses, more systematic.

9. Please explain the leading features of the business as now conducted?

Answer. To get the logs to mills as cheaply as possible.

10. What are the principal drawbacks and risks in the business and how, if in any way, can they be remedied?

Answer. Too much snow or rain.

11. How many times have you known the same pine land to be cut over and at what number of years interval?

Answer. Three times.

12. How do you account for pine not growing on land that has been cleared of pine?

Answer. A mat of pine needles form and prevent seed from taking root.

13. What, if any, economical way is there for maintaining the re-growth of white pine and preserving a permanent supply?

Answer. Don't know.

14. How long will the supply of white pine last if lumbering continues as at present?

Answer. Twenty-five years.

15. On what kind of soil and surface have you found the best white pine?

Answer. Sandy.

16. About how many pine trees in a hundred do you find to be worthless from being over-ripe or too old?

Answer. Impossible to answer.

17. About how many pine trees do you find to be worthless from other, and what, causes?

Answer. Impossible to answer.

18. Can you recommend any practical way for preventing such loss of trees?

Answer. No.

19. What are the dangers and injuries that pine forests are most liable to; and please state fully the best means for their prevention?

Answer. Fire.

20. To what extent have the pine forests been injured by fires in years past and how have such fires originated, so far as you know and believe?

Answer. Twenty per cent.

21. If you consider it practicable to burn the tree branches and tops left in lumbering, what is the best method of doing so?

Answer. No.

22. State any other facts that you think may be useful?

Answer .....

[Signature] SHEVLIN CARPENTER CO.

[Place and date] Minneapolis, April 17, 1897.

## STATEMENT OF THE NELSON-TENNEY LUMBER COMPANY.

1. How many years have you been engaged in the logging business in Minnesota?

Answer. Twenty-seven years.

2. In what county or counties do you operate? and are you cutting on your own land, or as a contractor on land of others?

Answer. Cass, Crow Wing and Itasca, both our land and contract.

3. Average number of hands usually employed by you in a season, in camps, under your exclusive control?

Answer. Three hundred some seasons and 500 some seasons.

4. Average wages paid per month including board?

Answer. Twenty-six dollars last two seasons; about \$22-\$35 twenty years ago.

5. Usual length of the season they are so employed?

Answer. About 8 months.

6. Number of draft animals used?

Answer. Fifty to 175.

7. Average annual amount expended by you for supplies, being products of agriculture, including live stock?

Answer. About \$25,000.

8. If there is improvement in the method of logging over what was the practice twenty-five or thirty years ago, please explain wherein.

Answer. Improved tools of all kinds, better camps, better stables, better sleds, better roads, better equipments of all kinds, horse teams instead of oxen, and railroads do hauling in some localities.

9. Please explain the leading features of the business as now conducted?

Answer. Roads well graded and kept well sprinkled with water so that they are always a smooth, solid sheet of ice. Horse teams to haul on road instead of oxen and a good snowplow to clean the snow out after a storm so that the teams can do the same amount each and every day.

10. What are the principal drawbacks and risks in the business and how, if in any way, can they be remedied?

Answer. Open winters with frequent warm and thawing spells of weather, or a winter with very deep snow 4 feet or more. I do not know of any remedy for this kind of weather.

11. How many times have you known the same pine land to be cut over and at what number of years interval?

Answer. When land was cut clean the first time I have never known of any pine growing on it afterwards.

12. How do you account for pine not growing on land that has been cleared of pine?

Answer. It seems to be natural for it to grow up with hardwood brush. I have never known white pine to come up from the seed on any land that was cleared by the axe or by fire.

13. What, if any, economical way is there for maintaining the re-growth of white pine and preserving a permanent supply?

Answer.....

14. How long will the supply of white pine last if lumbering continues as at present?

Answer. I think 30 years.

15. On what kind of soil and surface have you found the best white pine?

Answer. Level or a little rolling clay subsoil.

16. About how many pine trees in a hundred do you find to be worthless from being over-ripe or too old?

Answer. Not any.

17. About how many pine trees do you find to be worthless from other, and what, causes?

Answer. Fires destroy the most. A great many trees become worthless by the lower limbs dying and breaking off, letting water in at the knot-hole causing the tree to decay.

18. Can you recommend any practical way of preventing such loss of trees?

Answer.....

19. What are the dangers and injuries that pine forests are most liable to, and please state fully the best means for their prevention?

Answer. Fire and wind. Cannot prevent wind. Have the fire wardens enforce the law in full and we will soon have less forest fires.

20. To what extent have the pine forests been injured by fires in years past and how have such fires originated so far as you know and believe?

Answer. Twenty-five per cent. Some by Indians but more by careless white men living, traveling and operating in the country starting a fire to clear land or to camp by and paying no attention to it and letting it run at will.

21. If you consider it practicable to burn the tree branches and tops left in lumbering, what is the best method of doing so?

Answer. I think that it would be better not to burn them, but if it is done have a strip around the out-edge of the place to be burnt cleared up, brush piled back, then watch the fire until piece is burned over and not let fire get away.

22. State any other facts that you think may be useful?

Answer. People are very careless about setting fires and need watching, especially in spring and fall. A few arrests would have a good effect.

[Signature]

NELSON-TENNEY LUMBER CO.

By H. B. FREY.

[Place and date] Minneapolis, May 24, 1897.

## FORESTRY IN OTHER COUNTRIES.

The more the people of this state become informed in regard to forestry, and especially when they see how much it has contributed to the wealth and prosperity of the countries which have practiced it, the easier and cheaper it will be to enforce our forest preservation law. When our people come to know that there are countries in which the forests continuously yield a net annual income of from three to four dollars an acre their interest in the subject will be much quickened and they will lend their influence to uphold and enforce our forest preservation act. It was to give them an idea of the benefits and profits of forestry that I have procured from the best sources the following new and fresh accounts of forest administration in several European countries.

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DUCHY OF BADEN.

## STATE FORESTS.

The aggregate extent of the state forests of Baden is 240,304 acres, located in the Black Forest and the upper valley of the Rhine. The prevailing kind of trees is coniferous. The beech, however, covers the largest surface; next follows the fir, then the silver fir and the Scotch fir. The average estimated value per acre, taking the average of the ten years 1886-1895, is \$98.55. The annual aggregate expense of administration is \$568,078. The annual aggregate revenue amounts to \$1,235,332, and the net revenue is \$667,244. Number of acres annually sown to forest is 222, and the number of acres planted is 823. Reforesting is effected by seed from standing trees; also by planting trees, in some rare cases by artificial sowing, the latter in the case of firs. There is a gradual increase of crop. The usual method of cutting the crop consists in cutting the mature trees and covers at periods, as a rule, from thirty to forty years, with longer or shorter intervals.

Cutting in blocks clean (pines and Scotch firs) in exposed stormy situations is less frequent. According to paragraph 29 of the Forest Law of Baden of the year 1879, no part of any forest is allowed to be kept uncultivated. The number of forest fires during the years 1879-1888 was 61, the damaged surface 99 acres, and the damages amounted to \$2,225. The principal causes of such fires are negligence, when burning down the skirts of the forest, or by throwing away matches or stubs of cigars. Very few cases of fires are caused by railway locomotives.

The forest service ranks equally with other branches of the public service, and is comprised in Class D of the tariff of salaries. Seven members of the Administration of Domains (which forms a part of the Treasury Department) are the highest forest officers; they bear the title of Councillors of the Forest Board, and have a salary not exceeding \$1,380 and \$147 compensation for rent.

Besides the state forest there are community and corporation forests, covering a total surface of 555,069 acres, which are managed on the same principles as the state forests.

#### PRIVATE FORESTS.

The aggregate extent of the private forests is 451,670 acres. About one-third of all private forests is managed on forestry principles, including the forests of the Public Administration of Street, River and Railway Construction, and the most extensive and important private proprietors. The total forest product of the country increases gradually.

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### BAVARIA.

#### STATE FORESTS.

Bavaria, whose attractive capital, Munich, is frequented by so many Americans, has 6,000,000 inhabitants. Its forests comprise 2,150,000 acres, of which 34.08 per cent are the property of the state. Large forests are to be found in all parts of the kingdom; but as a general rule the mountain-

ous districts in the south (Alps), the north (Spessart) and northeast (Bohemian Forest) are covered with the densest forest. Of the whole area of the country 33 per cent is covered with forest. The prevailing kind of trees, or 77 per cent, are coniferous. The remainder comprise various kinds of deciduous trees—those losing their foliage in winter. Among the conifers red and white pine are most frequent. Among the deciduous trees the beech occupies the greatest space. The oak is also cultivated quite extensively for tanning purposes. The average estimated value of the forest land is \$50 per acre. The annual aggregate expense of administering the forests (1891) including salaries of officials, wages of workingmen, local taxation, new purchases, etc., amounts to \$4,965,204. The total revenue from the forests the same year amounted to \$8,187,349. Number of acres sown or planted to forests in 1892 was 14,800, more than three-fourths of which area was planted with coniferous trees. In the case of the red pine and the white pine, reforestation is mainly done in the natural way. In the case of the fir (*Pinus sylvestris*) it is always effected artificially; in the case of the beech, always in a natural way (seed from standing trees); in the case of the oak, generally by artificial sowing. There is a continuity of forest products and a steady increase of the revenue which the state derives from its forests. This is due, first to an increase of prices, secondly to an increase of the yearly crop. The latter must chiefly be regarded as a result of the present condition of the forests which are being and have been steadily improved; also of the economy which was practiced in former times. Where reforestation is effected by seeding from the standing trees, the crop is generally cut in lengthy strips, usually not exceeding about thirty yards in width. As a general rule the administration of the state forest makes it a principle to avoid cutting in large blocks clean. In regard to compulsory tree planting, it may be said that every forest area, the trees of which have been cut, no matter whether

state or private property, must be reforested in a short time, unless evidence can be furnished that the land would be better adapted to agricultural purposes.

The damage caused by forest fires is quite insignificant, being in 1890 only \$974, in 1894 only \$1,686. The principal cause of such fires is the carelessness of the workingmen employed in the forests and of individuals and parties making excursions, particularly on Sundays. There are no data at hand as to the number of such fires caused by railroad locomotives, and although some fires are no doubt so caused, the number is certainly very small.

The administration of the Bavarian state forests constitutes one of the departments of the ministry of finance. It is directly subordinate and responsible to the latter, no other authorities intervening. The highest forest official who may be regarded as being at the head of the forest administration, responsible, of course, as stated, to the minister of finance, bears the title "Ministerialrath,"—ministerial or cabinet councillor. The chief director of the Bavarian administration of state forests is "Ministerialrath" Ganghofer. His starting salary is 7,740 marks. After a sixteen years' service the salary advances to 8,820 marks. Next in rank are the so-called "Oberforstrathe," with a starting salary of 6,660 marks, which, after a sixteen-years' service, is increased to 7,740 marks.

There is no regular report published on the administration of the forests; however, the reports of the Royal Bavarian Bureau of Statistics, which are published four times a year and the "Statistische Jahrbuch fur das Konigreich Bayern," which is issued annually since 1894, contains some data referring to Bavarian forestry. In addition budget reports on the administration of the state forests are submitted to the "Landtag" or Diet every second year.

#### PRIVATE FORESTS.

The aggregate extent of private forests was 3,149,400 acres in 1893. In addition to the state and private forests



there are about 800,000 acres of forests belonging to separate towns and villages. The forests which are owned by great landholders are managed on forestry principles. These forests, however, only comprise a very limited area, somewhat less than 400,000 acres. Most of the private forests are the property of small landholders. The average value per acre of private forests is somewhat less than that of the state forests. The net income rate varies widely. The data at hand are too few and too unreliable to admit of arriving at any conclusion with regard to the average. Opinions vary as to whether the total forest product of the country increases or decreases. In general the extent of the private forests seems to be somewhat decreasing. This would of course also appear to entail a decrease of the total forest product. Forest lands are only allowed to be changed into agricultural lands when proof can be furnished that the agricultural crop may be expected to exceed in value the forest crop. Between 1886 and 1891 from 7,000 to 8,000 acres of private forests were newly planted or sown.

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## NORWAY.

### STATE FORESTS.

It is only but recently that Norway has manifested an interest in forestry, but as so many of the people of this state are natives of that country, it was thought expedient to show what is now being done there.

The extent of the state and semi-public forests of Norway is 2,587,500 acres. Of these 837,500 acres are located in the provinces of Tromsø and Finmark; 140,000 in that of Norrland; 285,000 in North Drontheim and 225,000 acres in South Drontheim and Romsdal, and about 397,500 acres in Hedemarken. The prevailing kind of trees are fir (*Pinus sylvestris* L.), pine (*Abies excelsa* D. C.), and two species of birch. The average estimated value of the forest land is \$2.70 an acre. The annual aggregate expense of administration is about

\$108,000, and the annual aggregate revenue varies from \$60,000 to 67,500. The number of acres annually sown or planted to forest varies from 150 to 175 acres. Reforesting is almost entirely effected by natural seeding from standing trees, and, when artificial culture is employed, by planting trees. The crop of forest production is periodical, and depends partly on the market prices of lumber. The forest administration tries to prevent the yearly average yield exceeding the net increase of the forest. Cutting must in part depend on the demand. Where it does not pay to cut smaller trees, the mature ones are principally cut, while at the same time, as far as possible, diseased and injured trees, as well as such as would hinder in the growth, are removed. Where, on the other hand, trees of smaller size can be profitably sold, small blocks are cut clean in order better to promote new growth.

The law of July 20, 1893, on the preservation of "Protecting Forests" and against the destruction of forests, has special provisions relating to "Protecting Forests," by which are meant forests serving as a protection against snow avalanches, stone slips, alteration of river beds, shifting sand, or as a special protection to other forests or to inhabited country. "Protecting Forests" are also such as bound districts and mountain forests, which, from their situation on the slopes of high mountains or in the neighborhood of the sea, or in the far north, grow so slow that they would die out if neglected. Under "Protecting Forest Lands" are also included bare fields, to be planted in the future to serve as other "protecting forests." The municipal council selects three men, who, after consulting the public forest officer, propose the localities within the district to be considered as "protecting forests." The municipal council has then to fix the boundaries of the forests, and on the proposition of the forest inspector of the district to determine the rules for its management. These regulations must have the sanction of the king to be valid. The municipal council can also

make reservations, subject to the king's approval, against the destruction of the forests in general. Such municipal regulations relating to "protecting forests" and forests in general may probably also include compulsory regulations as to planting and sowing of forests already cut down. No other laws relating to forest culture exist in Norway.

The damage caused by fires in the public forests is inconsiderable. Many years there is none; and the damage done to private forests is of small account and unreported. The principal cause or causes of such fires is carelessness of owners, fishermen, cowherds, etc., as well as the burning of heather for cultivation of the land. The law of July 14, 1893, on 'Fires in Forests and Fields,' with the supplemental law of July 27, 1896, has provisions relating to the prevention and extinction of forest fires.

The central administration of the forests is directly under the department of the interior, without intermediate officers. The service is under the charge of the chief (the director of the forests), and there are 4 forest inspectors, 25 forest officers, 1 forest engineer, 2 assistants, 7 forest planters and 363 forest guards. The yearly salary of the chief (the director) is \$1,450, without additions. The inspector's salary is \$800, increasing up to \$970. The forest officers', \$480, increasing to \$800. All these functionaries have their traveling expenses paid when traveling in the service of the state. The officers and the inspectors hand in every year a report to the director, who publishes a report on forest matters generally every third year. The only forest periodical in Norway at present is the "Tidsskrift for Skovbrug," (Periodical for Forestry), published by the Norwegian Association for Forestry.

#### PRIVATE FORESTS.

The aggregate extent of private forests is 18,000,000 acres, of which about 276,000 acres are managed on forestry principles. The average value per acre is from \$4.28 to \$5.36,

and the average annual rate of net income is from 55 to 60 cents per acre. The cutting undoubtedly exceeds the natural increase of the forests. The supply of wood is consequently decreasing, and the size of the trees decreases. The government purchases annually forests to the amount in value of \$21,440. It has three large and several smaller nurseries. These supply the required number of plants to the public and to private parties. It has also four seed establishments, which supply the public and private demand with tree seeds. It also has two elementary schools of forestry, and it tries through its functionaries to instruct forest owners in rational management of the forests.

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### SWEDEN.

Sweden is a country about a thousand miles in length, and the climate of its northern part is about like that of northern New England. The beech, which is not found in Minnesota, flourishes in southern Sweden. It is a natural forest country; possesses a great deal of granite and iron, and abounds in lakes and rivers. As stated in my report of 1872 on Swedish Forestry, the great mass of the forests of Sweden is found in the north central part of the country, and consists principally of the so-called Scotch pine and the white or Norway spruce, both of which grow to great size and are highly esteemed for their timber. The most numerous species next to these is the white birch, which furnishes the principal fuel. In traveling through Sweden one sometimes passes very rough, rocky and seemingly sterile tracts. But even on these, through the impulse of forest culture, is seen springing up a fine young growth of trees. Indeed in many of the European countries the clean, well cared for and thrifty forest is to the thoughtful American one of the most striking and impressive objects. Only those who have seen the well administered forests of Europe can have a true idea of what forestry means.

## STATE FORESTS.

The report of the Chief of the Swedish Administration of Forests for the year 1895 is a quarto document in Swedish of 331 pages, besides numerous maps. From this it appears that the total area of forest-bearing land in the whole country is 47,000,000 acres, of which 12,000,000 acres belong to the state. The taxable valuation of the state forests is \$16,000,000. The revenue from the state forests for 1895 was \$1,100,000. In addition there was appropriated for forestry purposes \$100,000. The expenses were \$360,000, leaving a net income of \$840,000. The net income annually increases. The number of acres in the whole country sown or planted to forest during the year was 11,000; length of ditching made in forestry work was 130,000 yards. Notwithstanding there was warm and dry weather during the spring and summer months (with, however, occasional heavy rains,) there were but few forest fires, the number of acres burnt over being only 1,280. Increased care is shown in the use of fire in the woods. More injury appears to have been done by the blowing down of timber trees by storms.

The sum of \$25,000 of public money was appropriated and expended for the advancement of private forestry. In the southern district 5,500,000 trees were planted and over 2,000 pounds of fir tree seed sown. There were detailed six civil engineers, paid by the state, to instruct and assist private owners in regard to forestry and their work of various sorts on over 85,000 acres. There are employed in the state forestry service 347 officials, of higher and lower rank, whose aggregate annual compensation amounts to a little over \$100,000. The state maintains a forest institute or college at Stockholm (founded in 1828) for scientific and practical training in forestry. It also has forest schools in various parts of the country.

In the two northern provinces, Norrbotten and Westerbotten, a law prevails prohibiting the cutting of trees for

sale which are less than eight inches in diameter fifteen feet from the ground, and investigations have lately been made to determine whether this provision of law should not be extended to other provinces.

Sweden's annual exports of forest products amount to \$20,000,000 a year, and are steadily increasing, the result of the liberal and wise management of her forest resources which has been practiced for many years.

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## WURTEMBERG.

Wurtemberg lies west of Bavaria, and is the third German state in point of area, its population being a little over 2,000,000. Its greatest length from north to south is 140 miles, and its greatest breadth is 100 miles. One-third of the Black Forest (so called from the dark foliage of its pines, and which forms a sort of a triangle,) lies within Wurtemberg, two-thirds being in Baden. The Black Forest has a total length of 93 miles, and its breadth varies from 13 to 46 miles.

### STATE FORESTS.

The aggregate extent of the state forests is 418,904 acres, and they extend over the entire kingdom: 59 per cent of the forests consists of pine, 20 per cent being pitch pine and 9 per cent white pine. The estimated value of the forest land varies from \$29 to \$58 per acre. The annual aggregate expense of administration of the forest amounts to \$1,183,574. Of this \$364,140 is paid to wood-cutters, \$147,560 is expended on roads, \$90,440 in forest culture, \$259,468 for pay of officials, \$138,468 for forest guards. The revenue for 1895-1896 was \$2,928,352, yielding a net revenue, after deducting all expenditures, of \$1,744,778, or \$3.63 per acre. The number of acres annually sown to forest is 296, and the number of acres planted to forest, 6,177.

In regard to reforestation, when the natural seeding of the desired kind of wood occurs in proper time the same is used; otherwise planting or artificial sowing takes place. Natural sowing is estimated at about 25 per cent, artificial renewing amounts to about 75 per cent. The latter is almost exclusively done by planting, whereas sowing in free woodland is very seldom applied. It is a principle to maintain (as far as the division of the age of the plantings permit) an equal annual cutting. At present the cutting is fixed at 1.94 cubic metres per acre. The cutting is contracted for with laborers living in the neighborhood of the woods. By good management there are at a given plot generally trees of about the same age. If the natural seed falling is intended to be used the larger trees, either single or in crops, are cut out in a direction against the prevailing winds; the remaining trees are thinned and gradually cut out as the growing young trees may demand. If the natural seed falling is not taken into consideration, the wood crop is cut clean in narrow strips, also in a direction against the prevailing winds, and the cutting of the second and following strips is postponed until the young plantings can dispense with the side protection of the old woods. It is a principle that replanting follows immediately after the cuttings. Moreover, the state buys every year about 400 acres of woodland to increase and round off the forests.

The amount of damage annually caused by forest fires is only \$642.60, and the principal cause of such fires is carelessness and negligence while smoking and lighting fires in or near the forests. In the last ten years out of 120 forest fires only 8 were caused by sparks from locomotives, and of these only one caused considerable damage (about \$3,570).

In regard to the rank in the forest service, as compared with other branches of the public service, it may be said that the forest officials rank in general equally with those state officials who are graduates of the university. The

Department of Forests is directed by one president, four technical and four administrative members and one commander of the forest guards. The salary of the president is \$1,844.50 per year; the salary of the members of the Board of Direction is from \$1,190 to \$1,618. A work entitled "The Forests of Wurtemberg," published by Rueger, Stuttgart, 1880, gives a fair review of the situation of the forestry of the country. It may here be stated that in respect to net revenue Saxony and Wurtemberg stand at the head of forest administration and culture in general.

#### PRIVATE FORESTS.

The aggregate extent of private forests is 528,794 acres, of which 210,000 acres are administered by technical forest officials; the remainder is also administered in a proper manner. As the permission of the government is required for cutting and replanting of forest lands, and this permission is only given under the condition that an equal area to what has been cut shall be planted, the aggregate area of forest land remains the same throughout the whole country; but portions of it are gradually coming into the possession of the state government.

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#### RATE OF INCREASE ON THE CUT-OVER TIMBER LANDS IN MINNESOTA.

During the past year Minnesota made a valuable contribution to the cause of forestry in the form of Bulletin No. 49 of the Agricultural Experiment Station, St. Anthony Park, Minn., prepared by Prof. Samuel B. Green, horticulturist, assisted by Mr. H. B. Ayers, timber expert, of Carlton, Minn. The bulletin shows the results of recent actual studies in the field of the rate of increase of timber on cut-over lands in the state, contains numerous striking illustrations, also quotations of the opinions of several prominent



lumbermen. One of its leading objects is to show that the proper management of forest land will be profitable to the individual owner. It is also designed to show what an immense loss would annually be caused to the state by forest fires in the absence of precautions against them. The following instructive passages are below quoted, omitting, however, the tables:

#### INCREASE ON SMALL TREES.

##### WHITE PINE OVER-TOPPED BY ASPEN.

Frequently, between the groups of log timber in the natural forest, are areas well stocked with pine not yet large enough to cut. These are left uncut in logging. On one-tenth of an acre that is typical of such forest was found the stock shown in Table XIV.

This plat is unusually heavily wooded. Lying immediately below a beaver dam, it has a good supply of water; the soil is fertile, porous, and over one-half clay. This acre is especially promising for a large yield of good timber. The pine trees will soon over-top and suppress the aspens and then will make a much more rapid growth than at present; the trunks are already long and free from branches. The number of white pine trees at present on this acre is 370, and will be abundant stock after the aspen is gone; in fact, the yield tables show for stock of first quality, of this height and age that about 214 trees is the normal number. Although the cubic feet of pine alone is less than the normal amount as given in the yield table, the amount of aspen and pine together is more than double this amount.

The 1,088 cubic feet of aspen may be removed and the pine left in better growing condition than it is now.

Assuming that this acre would, if the aspen were now cut, speedily reach the normal accretion (it is really expected to exceed it) the future growth may thus be found in the yield tables. On this basis, in twenty years from now, this acre, at present not worth logging, may be expected to yield, if protected from fire, 34,000 feet, B. M. If left 70 years, 50,400 feet, B. M.; 120 years, 70,000 feet with a possibility of its reaching 100,000 feet, the highest that may be hoped for in white pine.

There seems to be something incongruous in the fact that while this stock is worth nothing to-day in the market it would, in twenty years, yield 34,000 feet of lumber, Scribner's rule, worth say, \$3 per 1,000 feet on the stump, or \$102 for the acre. This discrepancy in the supposed present value of this stock is attributed to the danger of fire.

- The state is invited to consider this fact, for this and many other similar tracts are on school and other state lands, and the question should be determined whether efficient fire protection cannot be provided for less than this figure, which is \$5.10 per year per acre. A photograph of this tract is shown in figure 1.

#### WHITE PINE AMONG WHITE BIRCH.

Another well-stocked tract of timber trees, too small to cut, and surrounded by stump land, is represented by the following one-tenth acre of white pine among white birch shown in Table XV.

Under the above mentioned trees is a light growth of hazel and vine maple.

Comparing this with white pine in the yield tables, it is found there that an acre of white pine of second quality has a normal yield of 5,325 cubic feet at 85 years old, and an average height of 68 feet. As the white pine on this acre will probably over-top the birches within 25 years, it is thought that this one is in better condition than the normal one from the yield table, and while it would be unprofitable to cut this timber now, it may be expected when 100 years old, or 15 years from now, to yield at least 18,500 feet, B. M. This, at \$3 per thousand, would then be worth \$55.50 per acre. Its present worth, if safe from fire, should be \$26.69, yet it is of little if any value; this yield would be increased if the birch and aspen were cut at once. The soil is a light colored sandy loam of about the consistency of moulding sand, with a subsoil of boulder clay.

---

#### INJURIES BY FIRE.

Fires stand eminently as first among the causes of injuries to the forest.

Fires in our state have destroyed large areas of pine log timber before it could be made accessible to market. In the western and in the northeastern portion of the pine region are large tracts of either aspen or white birch with uncut pine stumps and stubs standing thick among the brush and saplings, and in the wide belt of sandy land sweeping from Red Lake through Becker, Hubbard and Crow Wing counties to Mille Lacs, much Norway pine has been destroyed. Where accessible to market and where there is demand for lumber, the loss by the killing of mature trees is comparatively slight, as such timber can be cut the winter following the burning without much loss.

When half grown stock is killed by fire the loss amounts to the present worth of this stock, the value of seeding and shading trees,

and the value of the forest soil, from this may be deducted whatever marketable stumpage there may be left. In the case of such acres as are shown in tables XVIII., XIX., XX. and XXI., although there is now no marketable timber upon them, yet they have a stock that would with usual growth and at present price of stumpage be worth from \$50 to \$92 per acre in 20 years. If there were no danger of fire the present value of this stock would be found by simply calculating the capital that would in 20 years amount to the average, or \$71 per acre at a reasonable interest at 5% the present value, in this case would be \$26.76. But the danger of fire has discouraged lumbermen from holding their land for a second growth.

It is impossible for fire to run over any forest land without doing great damage. This damage is difficult to estimate, but it is plain that whatever land is kept non-productive, is at least being kept from yielding the average 50 cubic feet or 500 board feet for each acre each year.

The greatest aggregate damage is probably done by light fires that repeatedly run over the ground and prevent a new growth.

Spring fires are very damaging, for the trees being then full of sap, endure little heat, and the seeds which are on the ground and possibly just sprouted are destroyed.

Autumn fires, owing to the ground being very dry at that season, usually run deep, burning off the roots of the trees and consuming all the vegetable material which constitutes that valuable mulch and fertilizer called the forest floor.

The tangible causes of forest fires have been discussed so much that they must now be well known. The real cause is more remote and in the minds of the people. It might be called the lack of appreciation of the damage done by fires. Two essential steps toward the prevention of fires are, an appreciation of this damage, and a thorough co-operation among the people injured. As every taxpayer in the state is injured by our forest fires all should co-operate cordially in the very important work of preventing them.

---

## DONATIONS TO THE STATE OF CUT-OVER AND WASTE LANDS.

A bill, known as the Forest Reserve Areas bill, which, after very full discussion, was passed by the house of representatives of the last legislature and recommended for passage in committee of the whole of the senate but which did

not reach a final vote in that body, provided a way whereby the state could receive and administer, on forestry principles, donations from individuals of cut-over and waste lands unsuited for agriculture. The project originated with and was drawn up with great care by Captain Judson N. Cross, a member of the Minneapolis bar and disinterested citizen, and previous to its introduction in the legislature had been before the public upwards of a year and been fully discussed and indorsed by the Forestry Association and State Horticultural Society.

As passed by the house of representatives the bill provided for a forestry board of nine members, to be selected in an impartial and non-partisan manner—namely, three by the regents of the University, one by the Agricultural Society, one by the Horticultural Society, one by the Forestry Association, one by the Fish and Game Commission, one to consist of the Horticulturist of the Experiment Station, and one to consist of the Chief Fire Warden. Of the revenue which should be derived from the lands two-thirds were to go to the support of public education and one-third to the state to defray the cost of administration and to indemnify towns in which the lands might be situated, in lieu of taxes, for support of roads.

It seems a misfortune that this bill failed to become a law. It was well known that at least one large owner of cut-over lands had promised, in the event of its passage, to donate to the state in different tracts an aggregate of 11,000 acres. Unquestionably any one who should donate land under such a law would be a benefactor.

The bill was exceedingly economical in all its features and if it had become a law it would, apparently, if wisely carried into execution, have inaugurated a forestry system of great benefit to the state.

## OPINIONS ON THE FIRE WARDEN LAW.

Many influential journals and periodicals have expressed favorable opinions of the attempt which Minnesota is making to prevent forest and prairie fires. The following are some of the more recent opinions on the subject:

*[Resolution Adopted by the American Forestry Association at its 15th Annual Meeting, held at Washington, D. C., Feb. 5, 1897.]*

*Resolved*, As a fundamental proposition of rational forestry, we commend the well-organized effort of the State of Minnesota to suppress forest fires, being aware that no advance can be made in forest management without such protection.

---

*[From a Letter of Mr. B. E. Fernow, Chief of the Division of Forestry, U. S. Department of Agriculture.]*

I am astonished to hear that there was danger of the legislature of your state abolishing the forest fire law. That there should be any disposition to annul or that there should be need of any argument to defend the protection against fire losses as provided is almost incredible and proves the position which I have frequently taken, correct; namely that we have not as yet reached a high plane of civilization, when it is still debatable, whether or not it is the first duty of government to protect property, forest property as well as any other property, against willful damage and destruction.

It augurs a low state of public or civic morality, that there can be a question as to whether it is or is not the duty of the state to prevent or to stop the forest fires, which injure present and future communal interests.

The loss by these forest fires is much greater than can be told by the amount of timber killed or other property burned up. The incidental losses are much greater than the direct losses. In the first place they discourage any man from taking care of a property so hazardous, they encourage uneconomical and wasteful cutting of timber in order to avoid loss of the same; they burn up not only but make often impossible a useful aftergrowth and render large areas unprofitable. It is within bounds to assert that the loss in money to the state by the forest fires is a hundred times greater by land becoming useless brush and hence untaxable, producing no value and becoming a burden to the taxpayers, than need ever be expended by the state in preventing these fires.

[*From the Northwestern Lumberman, Chicago, June 5, 1897.*]

There has been enough destruction of life and property from forest fires in Minnesota to force on the minds of people and legislature that it is not only a matter of good public policy, in an economic sense, to prevent forest fires, but it is a duty as well in point of simple humanity. Yet at its last session the legislature came near repealing the fire warden law. The law makes the state auditor forest commissioner, and the supervisors of towns, mayors of cities, and presidents of village councils fire wardens of their respective towns, cities and villages. There is also a chief warden, who may appoint such other wardens as he may deem necessary, living in or near the unorganized territory of the state. The chief fire warden receives a salary of \$1,200 a year, which is modest enough for an officer of such responsibilities. He represents the authority of the forest commissioner, and is required to enforce the law for the prevention or suppression of forest or prairie fires. He has charge of the fire wardens, and can mass them at places of especial danger from fire. He must coöperate with any local police force, or with any military force of the government which may be detailed to guard the national domain from fire. During a dry season, when forest or prairie fires are prevailing, or are liable to break out, he can use such means under his command as he may deem necessary to prevent or suppress fires, and expenses of such work are to be paid by the state, but must not exceed \$5,000 a year. The law is specific about the careless setting of fires, or leaving them to burn, and fines are assessable on those who are convicted of such wanton carelessness, and imprisonment is also made a penalty. There are other provisions in the law, all designed to prevent and suppress forest and prairie fires.

The law is a good one, and its only fault, it should seem, is that it is niggardly in the amount of appropriation which can be used in the service.

Nothing can be more essential than the prevention and extinguishment of forest fires. Millions of feet of good timber is annually destroyed in the pine states by fire. Not only this, but many lives are lost in the course of a few years in a manner the most horrible that can be conceived. It would seem that such examples as the conflagrations which swept Peshtigo, the "Thumb" of Michigan, Phillips, Wis., Ontonagon, Mich., Hinckley, Minn., and many other towns and localities in the last thirty years, should have made such a deep impression on the public mind in the states named that any promising preventive measure would be hailed with satisfaction and supported with enthusiasm for the sake of humanity, if nothing more. Especially should pine land owners and logging operators coöperate in preventive measures. They are the people whose property interests are involved, and the

ones who do more to make destructive fires possible than all others combined. They cut and haul away the logs, leaving the tops and branches where they fell, which in a year become like inflammable tinder, ready to leap into flame at the touch of a spark, and spreading conflagration as far as the debris covers the ground, often miles in extent. Since logging operators are allowed to leave so much food for fire without regard to the consequences, they are the last men who should have the face to presumptuously object to a warden law which seeks to mitigate the greater damage and horror of forest fires. They get off easily if they are simply required to acquiesce in the law and the warden service. \* \* \* \* \*

There is a growing sentiment in the country at large in favor of forest preservation. While any movement with this object in view should not prevent the use of mature or merchantable timber, or trench on the rights of private owners in this regard, there should be given all reasonable encouragement to public endeavor to prevent careless and wanton destruction of remaining forests. The first and main requisite to this end is to save the forests from fire. The warden law of Minnesota may not be perfect, and may need amendment; but it is a movement in the right direction and should be sustained. Repeal would be a step backward worthy only of a semi-barbarous state. It is to be hoped that before the meeting of the next legislature such an educational influence may be brought to bear that the cohorts of the fire fiend in that body, should they make another attempt at repeal, may be routed, foot, artillery and dragoons, and sent scurrying from the field.

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*[From the Mississippi Valley Lumberman, Minneapolis, June 11, 1897.]*

The forest fire law of Minnesota may yet prove a blessing to the people of the state before the year is over. Early in the spring fires began to burn in the timber regions northwest of Duluth, and while as yet they have not been serious, the worst time of the year—August and September—is yet to come. It seems strange that in the face of the great loss of life by the forest fires that burned Hinckley, Minn., and other villages, and burned to death hundreds of people three years ago this summer, that a legislature could even for a moment think of repealing the only law on the statute books looking towards the prevention of forest and prairie fires. This, however, as will be remembered by our readers, was attempted in the recent legislature of Minnesota, and was only defeated and the law allowed to stand by a small margin. The Minnesota fire warden law has only been tried

two years and should not be repealed until experience proves it to be entirely worthless, which it is not likely to do, and then some substitute should be provided for it. If the present law is faulty in any respect, it should be amended and made better. The lumbermen and loggers of the state are interested in the matter for the valuable property that belongs to them is constantly in danger during the summer months. They should be as careful as possible about leaving tree tops and other inflammable refuse on the ground after logging on a tract, to burn like tinder when ignited. It is the duty of presidents of village councils and mayors of towns to act as fire wardens, and, under the instructions of the chief fire warden, to call upon citizens to assist in putting out forest and prairie fires. It is not an easy matter to put out a first class forest fire, as all lumbermen and woodsmen know, but a great deal can be accomplished in preventing the starting of fires and in extinguishing incipient ones. Under the Minnesota law, the state auditor is *ex officio* forest commissioner. The chief warden reports to the auditor, and the fire wardens in every town report to the chief warden. The fire wardens have authority to compel citizens to come to their aid in putting out fires whenever necessary. There may be one fault with the Minnesota law in that it does not appropriate enough funds to carry on the work, only \$5,000 annually being allowed. *The Lumberman* hopes, for the protection of the lives and property of the residents of the forest regions of the state, that it will never occur to another legislature to attempt to repeal the forest fire warden law, without substituting for it a better law than the present one.

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[From Mr. Charles A. Keffer, Assistant Chief of the Division of Forestry, U. S. Department of Agriculture, Washington, D. C., June, 1897.]

The public interest in the protection of forests from fire has reached a point where no defense of legislation having this aim in view should be necessary. A review of such legislation shows that the setting of forest fires maliciously has been regarded a criminal offense since the early settlement of our country, but it has only been within the past two decades that adequate legislation for the protection of the forests has been enacted. Indeed such legislation can never be called adequate until the full protection which it seeks to assure is provided. The states in which the greatest advance in forest fire legislation have been made are Minnesota and New York. The Empire State is the original defender of its forests from fire, and the laws of the Western state named are based upon those of New York.

While extensive fires continue in every part of the forest area of the country, it is encouraging to know that both in extent and in de-



structiveness a noteworthy reduction has been made where the laws have been most perfected.

Forest fire legislation acts quite as much as an educational as a prohibitive force. In the State of Minnesota, for instance, the writer in his travels throughout the state, in both prairie and forest regions, has been confronted with the printed law at every railway station, and he has frequently seen them in schools and postoffices. Otherwise careless citizens have thus had their attention called to this important matter, and the most prolific cause of forest fires, thoughtlessness or carelessness, has been averted. For there can be no question that neglect or lack of proper care in the kindling and extinguishing of useful fires is a most prolific source of danger to the forest. The pleasure seeker, whose attention has been attracted at every station between his city home and his outing place, has been awakened to the damage his carelessness may cause. The woodsman, to whom life-long familiarity with camp fires has only brought indifference in their handling, will be arrested and restrained by the knowledge that such carelessness is criminal. The railroad employe will be more and more careful in cleaning his right-of-way, knowing the danger of dismissal which is likely to result if his company is held responsible for damage that he has caused.

And thus it appears that following the passage of legislation, that is to a degree in advance of public opinion, the first beneficial result to be noted is in the nature of education. During this period there is sure to be something of a reaction against the law itself, but this reaction must not only be withstood, it must be overcome, and the reform extended until the imperiled right or resource shall be fully protected. The states within the forest area have so long endured destructive forest fires that the people have come to regard them as a necessary evil. It required the awful holocaust of Hinckley to awaken us fully to the fact that the remedy of such calamities is within ourselves—that we have only to respect property rights as we do human rights to make forest fires almost an impossibility.

Existing forest fire legislation is nowhere perfect; there is yet to be devised a system that shall include as its basis the patrol of the forest for the detection of incipient fires, and the arrest of careless citizens who may cause them. Such a system seems yet too expensive to the average American, but the expense is as nothing compared to the value of the resource it is sought to protect, and with fuller appreciation of our forests will come adequate means for their protection.

## THE ONTONAGON, MICH., FOREST FIRE AGAIN.

Fearing lest the telegraphic reports, at the time, as to damage caused by the forest fire at Ontonagon last August (during the same sort of weather that we had in Minnesota) might have been exaggerated, I wrote to the postmaster there for information and received his reply after a part of this report had been printed. He states:

The loss went over a million dollars, probably one and a quarter million. The town is not building up again. The only industry we had has moved away from here to Green Bay, Wis. We had two fine saw mills, owned by the Diamond Match Co., and they have bought a mill at Green Bay and are hauling their logs away, which leaves this town without any industry whatever.

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CONCLUDING REMARKS.

With regard to the effectiveness of the fire warden law people should remember that a large part of the territory in northern Minnesota is uninhabited and consequently without fire warden service. Such territory is frequented by hunters, land seekers, timber cruisers, mineral prospectors and others, and fires are liable to occur. Warning placards, however, have been posted in a part of the territory, and scarcely any one now going into the woods has failed to see such warning notices at some place. If means were available for keeping reliable patrols in the forest during dry weather the danger from fires would be lessened.

"Take precautions!" Section 6 of the Forest Preservation Act provides: "It shall be the duty of each fire warden to take precautions to prevent the setting of forest or prairie fires." Prevention is the one great thing; and I have instructed fire wardens not only to post warning notices but to verbally caution people against causing fires in dry weather; also, in a very dry season to go over their districts to see that no dangerous fires occur. Some effective prose-

cutions have been made for violations of the law and others will be made if occasion arises.

But the main work under the fire warden law is educational; to make people more careful about causing fires, and more thoughtful of the benefit to the public and to individuals of forest resources. When people understand the benefits to be derived from a rational management of our forests and forest lands, then, and not till then, will there be a public sentiment that will make the fire warden law as effective as it should be.

There are several million acres, in detached areas, in our state only fit for growing timber. Trees take from the soil only a twelfth part of the mineral substances required for field crops, hence it is profitable that the non-agricultural lands be retained in or planted with timber. Properly protected and managed our forests might afford a sustained, permanent and growing industry, furnishing in logging and the working up of lumber wages for many thousand more laborers than are now employed.

Forests hold much more moisture than bare land, they maintain the supply of water in streams and tend to prevent overflows and inundations; they enrich the soil; they modify the extremes of temperature and lend beauty to scenery. Forest belts, as windbreaks, lessen the injury of droughts. Forest fires not only destroy valuable property but they make families afraid to come in and settle up the land available for agriculture. These are some of the facts that old and young might think of with profit.

As a means for awakening increased interest in the subject of forestry I would recommend that at future meetings of the Farmers Institute some one of the speakers be designated to explain and advocate the principles of forestry. Also, I would hope that the Forestry Association would try to organize through the state local forestry societies.

The legislature of New York has just appropriated \$1,000,000 to purchase for the state more forest land in the

Adirondacks in addition to the 800,000 acres the state now owns. Our neighbor, Ontario, has reserved as a forest park for the recreation of her people over a million acres of beautifully timbered land in one body, only 150 miles from Toronto, and which even now attracts tourists from the United States. It is estimated that New Hampshire annually receives from 40,000 to 50,000 visitors attracted by her mountain and forest scenery and who leave in the state \$6,000,000 to \$8,000,000.

Minnesota, more richly endowed with lake and originally with forest scenery than almost any other state, has the Itasca state park of 19,000 acres 240 miles north of St. Paul and of which 7,000 acres were given by Congress on condition that the state would protect the timber, and 2,452 acres bought of the Northern Pacific Railroad Company at fifty cents per acre. The park is well wooded with pine and other varieties of trees, and if enlarged will prove of great value. Nearer than that, on the shores of Mille Lacs lake, Leech lake and near Cass lake, are still splendid original forests, and if the state would now, when it can do so cheaply, acquire possession of and hold for park purposes a large area in one or more of these localities it would eventually, among other advantages, be the means of attracting a great many visitors to our state and also help to develop interest in better forest management.

Respectfully submitted,

C. C. ANDREWS,  
*Chief Fire Warden.*

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FOREST PRESERVATION

T. 5520  
(C IV, 108)

# THIRD ANNUAL REPORT

OF THE

CHIEF FIRE WARDEN

OF

MINNESOTA

UNDER THE ACT OF THE LEGISLATURE ENTITLED  
"AN ACT TO PROVIDE FOR THE PRESERVATION OF FORESTS OF THIS STATE  
AND FOR THE PREVENTION AND SUPPRESSION OF FOREST AND  
PRAIRIE FIRES," APPROVED APRIL 15, 1895.

FOR THE YEAR 1897.

ST. PAUL, MINN.:  
PRINTED BY THE PIONEER PRESS COMPANY  
1898.





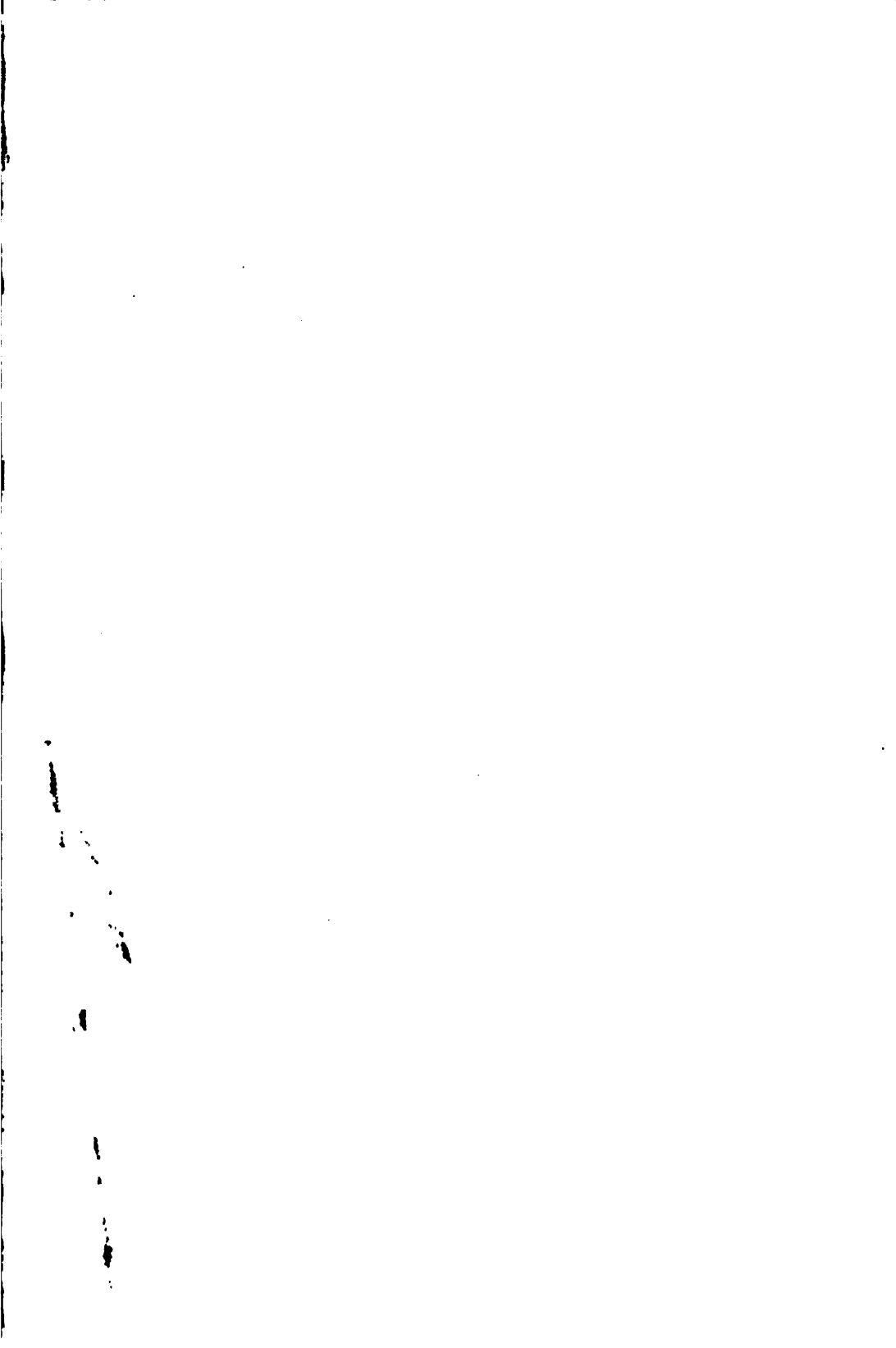




Photo by F. L. Hoxsie.

MODERATELY CLOSE STAND OF WHITE PINE, ITASCA COUNTY (1897).

# FOREST PRESERVATION

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## THIRD ANNUAL REPORT

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### CHIEF FIRE WARDEN

OF

### MINNESOTA

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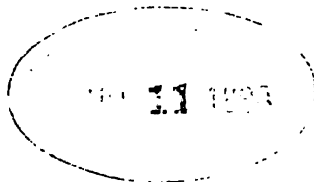
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FOR THE YEAR 1897.

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ST. PAUL, MINN.:  
 PRINTED BY THE PIONEER PRESS COMPANY  
 1898.



*The State of Minnesota*

STATE OF MINNESOTA,  
OFFICE OF CHIEF FIRE WARDEN,  
ST. PAUL, March 31, 1898. }

*Hon. R. C. Dunn, State Auditor and Forest Commissioner,*

SIR: As required by section 3 of the Act for the Preservation of Forests, etc., approved April 18, 1895, I have the honor to submit, herewith, my annual report for the year 1897.

Very respectfully,

C. C. ANDREWS,

*Chief Fire Warden.*

# THIRD ANNUAL REPORT

OF THE

## CHIEF FIRE WARDEN

OF MINNESOTA.

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About three weeks of very dry weather prevailed in the latter part of April and first part of May, 1897, in an extensive forest area, the center of which was the southern part of Beltrami county. Some damage was done to standing white pine in that county, but the loss was reduced by the pine being cut the present season. A fair proportion of the fires was extinguished or controlled by fire wardens and citizens who assisted them. It is an interesting fact that the timber on the Itasca State Park which was threatened by a dangerous fire was saved from damage, partly by the efforts of fire wardens. The total number of acres of forest land, including light brush and marsh, burned over was 66,020. The total amount of damage was \$22,455. Considering that the standing timber in the state, at a low valuation, is worth \$100,000,000, the amount of damage is small. Sixty-one per cent of the forest fires were extinguished or controlled by fire wardens.

Further particulars in regard to forest fires will be found in the following summary:

## SUMMARY OF FOREST FIRES, 1897.

COUNTY AND TOWNS.	Date.	Acres.	Damage.	Cause.
<b>Becker County—</b>				
Burlington.....	May 15.....	160	\$80	Railroad locomotive.
Cormorant .....	Sept. 23.....	15	22	Threshing engine.
Erie .....	June 10.....	2	None	Burning brush.
Evergreen.....	May 15.....	*400	10	Burning meadow.
Green Valley.....	May 4.....	240	35	Unknown.
Height of Land.....	April 12.....	75	175	Unknown.
Osage .....	May 5.....	3,000	5,000	From Indian reservation
Richwood .....	May 2.....	1,500	400	Unknown.
Silver Leaf .....	May 9.....	100	300	Unknown.
Silver Leaf .....	May 16.....	200	100	Burning brush.
Walworth .....	April 18.....	640	50	Railroad section men.
Wolf Lake.....	March 8.....	200	25	Burning brush.
Township 141-36.....	April 17.....	160	25	Indian camp fire.
Township 141-36....	April 19.....	3,000	600	From adjoining town.
<b>Beltrami County—</b>				
Bear Creek.....	May 3.....	1,700	800	Clearing land.
Bear Creek.....	May 5.....	1,000	200	Clearing land.
Moose Creek .....	May 3.....	6,000	1,000	From Indian reservation
Township 144-36.....	May 2.....	6,400	150	Burning meadow.
Township 147-37....	May 10.....	*600	Slight	Camp fire.
Township 147-37....	Aug. 18.....	100	450	Indian camp.
Township 149-30....	Oct. 6-9.....	25	200	Camp fire.
Township 150-31....	Oct. 3.....	25	1,000	Camp fire.
Township 150-34....	Oct. 1.....	2,500	1,000	Camp fire.
Township 150-36....	June 28.....	1,200	500	Camp fire.
<b>Benton County—</b>				
Glendorado.....	April 28.....	160	None	Unknown.
Mayhew Lake .....	Oct. 18.....	40	20	Unknown.
<b>Carlton County—</b>				
Knife Falls.....	April 26.....	30	200	Sparks from saw mill.
<b>Crow Wing County—</b>				
Crow Wing.....	May.....	*2,000	None	Unknown.
Deerwood.....	May 19.....	40	None	Burning brush.
Maple Grove .....	April 15.....	300	None	Burning R. R. rg't of way
Oak Lawn.....	May 7.....	500	200	Clearing land.
St. Mathias.....	May 1.....	2,400	100	Unknown.
Township 138-27....	Sept. 2.....	3	None	Railroad locomotive.
<b>Hubbard County—</b>				
Akely .....	May 6.....	60	100	Clearing land.
Arago .....	May 15.....	600	100	Clearing land.
Henrietta .....	May 8.....	300	500	Unknown.
Lake Emma.....	May 1.....	2,000	Slight	Camp fire.
Township 139-33....	Oct. 1.....	100	Slight	Hunters.
Township 142-32....	May.....	.....	200	Unknown.
Township 143-32....	May.....	.....	600	Unknown.
Township 144-35....	May.....	1,000	300	Burning brush.
Township 144-34....	May.....	2,000	500	Hunters.
<b>Itasca County—</b>				
Township 54-22.....	April 27.....	120	50	Burning R. R. rg't of way
Township 57-25.....	Oct.....	100	50	Unknown.
Township 151-29....	Sept. 25.....	5	150	Clearing land.

SUMMARY OF FOREST FIRES—*Continued.*

COUNTY AND TOWNS.	Date.	Acres.	Damage.	Cause.
<b>Kanabec County—</b>				
Hillman .....	May .....	*6,000	\$500	Burning marsh.
<b>Kandiyohi County—</b>				
New London .....	May 23.....	200	800	Unknown.
<b>Morrison County—</b>				
Clough .....	April 25.....	60	200	Clearing land.
Clough .....	May .....	160	300	Camp fire.
Cushing .....	April 19.....	100	100	Unknown.
Cushing .....	April 21.....	320	300	Clearing land.
Little Falls .....	May 4.....	1,200	500	Burning brush.
Mount Morris.....	Oct. 29.....	80	None	Burning meadow.
Pike Creek .....	April 25.....	2,500	100	Clearing land.
Scandia Valley.....	May 14.....	1,800	None	Unknown.
<b>Otter Tail County—</b>				
Homestead .....	April.....	300	None	Clearing land.
<b>Pine County—</b>				
Chengwatana.....	April 25.....	1,200	300	Unknown.
Pine City.....	May 30.....	640	None	Unknown.
<b>Polk County—</b>				
Rosebud .....	May 1.....	*150	30	Burning rubbish.
<b>Todd County—</b>				
Faun Lake .....	April 27.....	5,000	2,000	Unknown.
Germania.....	May 2.....	300	200	Clearing land.
Grey Eagle.....	April 25.....	300	50	Burning meadow.
Iona.....	April 27.....	*250	Slight	Clearing land.
Reynolds.....	April 27.....	100	.....	Clearing land.
Round Prairie.....	May 10.....	80	50	Unknown.
Villard .....	April 27.....	1,800	2,000	Railroad locomotive.
Wykeham .....	April 15.....	160	600	Clearing land.
<b>Wadena County—</b>				
Lyons .....	May 7.....	*360	None	Clearing land.
Lyons .....	May 8.....	1,200	None	Unknown.
Thomastown .....	May 2.....	*600	35	Unknown.
Thomastown .....	May 8.....	160	None	Clearing land.

\* Brush and meadow.

Total acres burned over, 66,020. Damage, \$22,455.

## Classification of causes:

From clearing land, 16.

From burning brush and meadows, 11.

From camp fires and hunters, 11.

From railroad locomotives, 3.

From other causes, 8.

Unknown, 21.



Very dry weather prevailed in the autumn over a large extent of prairie country. The principal fires occurred in Roseau county. The ground was bare of snow in much of the prairie country through November and December, and some fires occurred in both those months. The total area burned over by prairie fires was 97,146 acres, and the damage was \$14,554. The reports showed that thirty-seven prairie fires were extinguished or controlled by fire wardens and their helpers.

## SUMMARY OF PRAIRIE FIRES, 1897.

COUNTY AND TOWNS.	Date.	Acres.	Damage.	Cause.
<b>Big Stone County—</b>				
Big Stone .....	April 31.....	400	None	Burning stubble.
Big Stone .....	May 3.....	200	None	Unknown.
Moonshine .....	Sept. 29.....	480	\$1,300	Threshing engine.
<b>Chippewa County—</b>				
Grace .....	Nov. 6.....	1,000	35	Burning grass.
Louriston .....	Nov. 6.....	300	30	From adjoining town.
Rheiderland.....	April 16.....	100	None	Unknown.
<b>Clay County—</b>				
Alliance.....	April.....	50	50	Burning grass.
Cromwell.....	May 7.....	150	None	Railroad locomotive.
Cromwell.....	Sept. 27.....	75	None	Camp fire.
Hagen .....	Nov. 25.....	600	50	Threshing engine.
Morken .....	Nov. 5.....	15	25	Threshing engine.
<b>Kittson County—</b>				
Deerwood.....	May 1.....	400	None	Unknown.
<b>Lac qui Parle Co.—</b>				
Garfield .....	Nov. 16.....	500	90	Unknown.
Manfred .....	April.....	1,400	.....	Burning grass.
Mehurin.....	Sept. 24.....	40	60	Burning straw.
Mehurin.....	Nov. 16.....	2,000	150	Unknown.
Perry.....	Sept. 29.....	40	Slight	Railroad locomotive.
Walter .....	Sept. 20.....	10	Slight	Railroad locomotive.
Walter .....	Sept. 23.....	60	225	Railroad locomotive.
Walter .....	Sept. 27.....	80	Slight	Railroad locomotive.
Walter .....	Sept. 28.....	30	38	Railroad locomotive.
Walter .....	Sept. 29.....	40	Slight	Railroad locomotive.
Walter .....	Oct. 2.....	30	Slight	Railroad locomotive.
<b>Lincoln County—</b>				
Lake Stay.....	Oct. 27.....	640	50	Boys with matches.
Limestone.....	Nov. 17.....	1,900	25	Unknown.
Verdi .....	April 27.....	1,100	120	Burning straw.
<b>Marshall County—</b>				
Alma .....	May 10.....	600	60	Unknown.
Comstock .....	April 30.....	50	75	Burning grass.
Grand Plain.....	Nov. 12.....	200	None	Unknown.
New Folden.....	Dec. 1.....	160	20	Unknown.

SUMMARY OF PRAIRIE FIRES.—*Continued.*

COUNTY AND TOWNS.	Date.	Acres.	Damage.	Cause.
<b>Murray County—</b>				
Ellsborough .....	May 12.....	200	200	Burning stubble.
<b>Norman County—</b>				
Good Hope .....	Nov. 17.....	5,000	None	Unknown.
<b>Pipestone County—</b>				
Ætna .....	Oct. 28.....	2,000	400	Railroad locomotive.
Altoona .....	Nov. 3.....	160	20	Burning straw.
Osborn .....	October.....	300	.....	Unknown.
<b>Polk County—</b>				
Badger .....	May 5.....	840	40	Unknown.
Belgium .....	Oct. 23.....	200	None	Clearing land.
Belgium .....	Nov. 20.....	2,000	None	From adjoining town.
Hammond .....	Nov. 9.....	500	None	Unknown.
Hammond .....	Nov. 12.....	600	50	Unknown.
Hertsville .....	Nov. 20.....	200	None	Unknown.
Onstad .....	Oct. 8.....	5	None	Locomotive engine.
Russia .....	Nov. 26.....	800	None	Unknown.
<b>Pope County—</b>				
Hoff .....	May 3.....	200	150	Unknown.
<b>Red Lake County—</b>				
Bray .....	Nov. 5.....	200	None	Unknown.
Bray .....	Nov. 20.....	2,000	None	Unknown.
Lake Pleasant .....	Oct. 14.....	10	\$50	Burning straw.
Polk Centre .....	May 2.....	1,000	100	Burning grass.
Rocksbury .....	Dec. 4.....	1,900	150	Unknown.
Saunders .....	May 12.....	500	11	Unknown.
Saunders .....	Nov. 19.....	250	20	Unknown.
<b>Redwood County—</b>				
Gales .....	May 2.....	400	500	Unknown.
Waterbury .....	Nov. 27.....	5,000	125	Unknown.
<b>Roseau County—</b>				
Barto .....	Oct. 2.....	15,000	1,500	Burning fire break.
Deiter .....	Aug. 20.....	8,000	2,000	Burning fire break.
Pohlitz .....	Oct. 1.....	300	1,600	From adjoining town.
Skagen .....	Oct. 7.....	2,000	165	Unknown.
Soler .....	Oct. 3.....	15,000	1,100	Burning fire break.
Spruce .....	Nov. 11.....	200	30	Burning fire break.
<b>Stearns County—</b>				
Crow River .....	Sept. 8.....	2	25	Lightning.
<b>Stevens County—</b>				
Eldorado .....	Oct. 10.....	18	None	Burning fire break.
Everglade .....	Nov. 1.....	4,000	125	Burning straw.
<b>Swift County—</b>				
Cashel .....	Nov. 16.....	200	40	Unknown.
Clontarf .....	Nov. 20.....	4,000	None	Unknown.
Tara .....	Nov. 15.....	1,600	None	Unknown.
<b>Traverse County—</b>				
Dumont, village of..	Dec. 30.....	10	None	Accident.
Dollymount .....	Sept. 30.....	40	800	Steam thresher.
Taylor .....	Oct. 3.....	*1	65	Steam thresher.

SUMMARY OF PRAIRIE FIRES.—*Continued.*

COUNTY AND TOWNS.	Damage.	Acres.	Damage.	Cause.
<b>Wilkin County—</b>				
Akron .....	Oct. 2... ..	1,500	400	Burning straw.
Champion .....	Oct. 1.....	70	450	Railroad locomotive.
Champion .....	Oct. 4.....	15	30	Threshing engine.
Manston .....	Oct. 2.....	2,000	800	Unknown.
Meadows .....	Sept. 23.....	3,000	400	Unknown.
Mitchell .....	April.....	1,800	50	Burning straw.
Mitchell .....	Nov. 18.....	1,200	None	From adjoining town.
Nordick .....	Oct. 2.....	600	300	From adjoining town.
Nordick .....	Oct. 20.....	20	.....	Threshing engine.
Roberts .....	Oct. 15.....	5	40	Unknown.
<b>Yellow Med. Co.—</b>				
Burton .....	April 23.....	2,000	None	Unknown.
Burton .....	Oct. 27.....	800	100	Burning fire break.
Burton .....	Nov. 13.....	1,500	85	Unknown.
Florida .....	May 7.....	640	200	From Dakota.
Minnesota Falls.....	October .....	10	Slight	Railroad locomotive.

\* Field.

Total acres burned over, 97,146. Damage, \$14,554.

Classification of causes:

Railroad locomotives, 11.

Threshing engines, 8.

Burning straw or stubble, 8.

Burning fire breaks, 8.

Other causes, 16.

Unknown, 33.

## FIRE WARDENS' REPORTS OF FIRES.

Section 7 of the Fire Warden Law provides that, "the chairman of boards of township supervisors, presidents of villages and fire wardens appointed by the Chief Fire Warden shall inquire into the cause of each forest or prairie fire within their districts and shall report the same to the Chief Fire Warden and the methods used to control or extinguish such fires, and the amount of property destroyed and the number of lives lost, if any, and report such other facts in regard to said fires as said Chief Fire Warden may require. During the more dangerous season of the year the Chief Fire Warden may require frequent reports from





Photo by F. L. Hoxie.

**CUT AND BURNED OVER PINE LAND IN HUBBARD COUNTY.**

the chairman of township boards, or in unorganized towns, from fire wardens appointed by the said Chief Fire Warden, as to condition of forest and prairie fires, and as to what is being done to control the same."

It is thus seen that in organized towns it is the duty of the chairman of the town board to report in regard to fires. When shall he make his report? The law means, of course, that he shall make and send his report in reasonable time. And what is reasonable time? If a man were to contract to put in a crop of wheat, the law would hold that he should do it in reasonable time; and two weeks after a suitable time would not be reasonable time. So in reporting fires, the meaning of the law is that they should be reported promptly, or as soon as a thorough and business-like inquiry into the cause of the fire can be made. It is only by thoroughly investigating, fixing responsibility and prompt reporting fires, that the habit of carelessness in causing them can be checked.

Copies of a blank, of which the following is a condensed form, on half letter sheet with return stamped envelopes, were duly furnished to chairmen in organized towns and to appointed fire wardens in unorganized towns; and the reports of fires that were made are preserved in the office of the Chief Fire Warden.

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## STATE OF MINNESOTA.

### FIRE WARDEN'S REPORT OF FIRE.

*To the Chief Fire Warden, St. Paul, Minn.:*

A [state whether forest, prairie or field fire].....fire occurred in the [state what part of town].....part of the Town of..... being Township No.....Range.....in the County of..... on the.....day of.....[state about what time of day]..... It burnt over.....acres of [state kind of land, whether field, prairie, brush, meadow, heavy or light timber].....destroyed..... and did damage to the amount of..... Said fire originated on Section No.....being land occupied by.....[if vacant so state]

.....and was caused by [explain how it originated]  
.....  
.....

The fire was extinguished in.....hours after it started. There were  
.....persons called to help extinguish it. [If none were called, so  
state.] The number of persons assisting in extinguishing the fire was.....  
The fire was extinguished in the following manner.....  
.....  
.....

The weather was.....  
[Add any other facts bearing upon the matter. Also, give the name of any  
one who rendered particularly praiseworthy service and what service; and  
the name of any Fire Warden who was present and assisted in controlling or  
extinguishing the fire.]

P. O..... Signature.....  
Date..... Name of Organized Township.....

PRECAUTIONS AGAINST FIRES.

Under date of May 26, 1897, three copies of the follow-  
ing circular of instructions were mailed to the chairman of  
each town board of supervisors in each organized town in  
forest and prairie regions, so that a copy could be furnished  
to each supervisor:

C. C. ANDREWS,  
*Chief Fire Warden.*

R. C. DUNN (State Auditor),  
*Forest Commissioner.*

STATE OF MINNESOTA,  
OFFICE OF CHIEF FIRE WARDEN, }  
St. Paul, Minn., May 26, 1897.

*To Fire Wardens:*

I. A package containing ten warning placards has just been mailed  
from this office to each chairman of town board and to each fire war-  
den in unorganized territory, and they should be carefully posted, as  
provided by Section 4 of the Forest Preservation Act of April 18,  
1895. If any should be received by chairmen in towns so much  
settled as not to require precautions against forest or prairie fires the  
town board can exercise its discretion in regard to their being posted.

II. Chairmen are requested to promptly fill and return the blank  
entitled "Fire Wardens for 1897;" also, hand to their colleagues a  
copy of within circulars, which should be carefully studied.

III. Section 6 of said law requires you to "TAKE PRECAUTIONS TO PREVENT the setting of forest or prairie fires." It may be about impossible to extinguish a forest fire in dry and very windy weather, but if fire wardens do their duty thoroughly they can almost entirely prevent the occurrence of dangerous fires. It is a violation of Section 9 of the Act for anyone to set a fire in dry weather. Fire wardens must make this known and they must firmly enforce the law by exemplary prosecutions. This is the third year the law has been in operation and it should now be strictly enforced. Fire wardens will themselves be liable to prosecution if they fail to have it so enforced. They should take a pride in being able to report at the end of the season that no fires have occurred in their town.

IV. The annual reports of fire wardens for 1896 show there were in that year fifteen less forest and prairie fires caused by railroad locomotives than in 1895. There is, however, much room for further improvement. An engineer whose locomotive sets fire a second time should be prosecuted. It would not be advisable, however, on making arrest to take him from his train, but he should have a week or ten days' notice in which to appear and answer before the court. Such offenses are likewise indictable by the grand jury. Fire wardens owe it to themselves to see that there is in their districts a marked decrease of fires caused by railroad locomotives.

V. Complaint has been publicly made within the last few months that fires have been set by people to obtain pay for putting them out. Such criminal and disgraceful proceedings may have occurred in a few instances, but they certainly cannot be common. Fire wardens who have reason to suspect any offense of this sort should, for the honor of their community, have it stopped, and it is hoped they will use a wise course and accomplish such object.

VI. Several complaints have been received from fire wardens that the county commissioners have refused to audit their accounts. Under Section 8 of the Forest Preservation Act of April 18, 1895, county commissioners have authority, and it is their duty, to reject any item or account if they are not satisfied of its justice. They cannot, however, arbitrarily refuse to audit (examine and settle) an account. If they were to so do, or unjustly disallow accounts, they would practically nullify the law. It is their duty to "audit" the accounts of fire wardens and their helpers and allow what, as fair-minded men, they are satisfied is just. Section 8 of Chapter 91 of the General Laws of Minnesota 1878 applies to all public officers.

VII. The diffusion of knowledge in respect to forestry will promote observance of the Forest Preservation Act. When people understand how much the wealth of our state could be increased by a proper



management of its forest resources they will be much more careful about causing forest fires. Forestry means the raising of timber on land not suitable for agriculture. In Saxony and Wurtemberg (among other countries) which have long had superior forestry management, a continuous annual net profit of from \$3 to \$4 per acre is derived from the forests. If Minnesota will lay the foundations of a good forestry system (and the prevention of forest fires is the first important step in such a system) it will build up a continuous, increasing and grand labor-furnishing resource, and those who are doing ever so humble a part in the feeble beginning of this work may feel that they are rendering honorable service to their community and state.

Thousands of new settlers and farmers in the older states made the great mistake of clearing up land that was only suitable for forest. From such tracts they obtained a very few crops and then the land rapidly degenerated till now it is, in many places, but little else than naked sand. Whereas, if they had left such tracts in forest it would have been a source of continuous profit to them. Many settlers in northern Minnesota are repeating the same mistake. It would be more profitable for them if they would look further into the future and retain in forest every acre that is really unsuitable for agriculture.

The more you can interest people in the important subject of forestry the lighter will be your work of enforcing the law.

Very respectfully,

C. C. ANDREWS,

*Chief Fire Warden.*

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#### FIRES SET BY RAILROAD LOCOMOTIVES.

The Fire Warden Law imposes many precautions upon railroad companies for the prevention of forest and prairie fires. They are to use efficient spark arresters on all their engines and keep their rights of way clear of all combustible materials; in dry seasons they are to give "particular instructions" to their employes for the prevention and prompt extinguishment of fires. The number of forest fires reported as having been caused by railroad locomotives in 1897 was three, and the number of prairie fires reported as so caused was eleven; in all fourteen, being three less than the number reported in the previous year. As required by

law, a sufficient number of warning placards, printed on cloth, was furnished early in the season to each railroad company operating in this state; also early in the autumn enough copies of the following circular were furnished to the companies to enable them to supply a copy to each of their station agents, locomotive engineers and section men:

STATE OF MINNESOTA,  
OFFICE OF CHIEF FIRE WARDEN,  
St. Paul, Minn., Sept. 2, 1897.

PREVENTION OF FOREST AND PRAIRIE FIRES.

*To Railroad Companies Operating in Minnesota:*

According to the reports of Fire Wardens, the number of forest and prairie fires set in 1896 by railroad locomotives was seventeen, being fifteen less than in the previous year. However, there were seventy-four fires, the origin of which was reported as "unknown."

The fact that we have had a wet summer makes it more probable that the autumn will be dry. Section 12 of the Forest Preservation Act of April 18, 1895, provides: "In seasons of drouth railroad companies shall give particular instructions to their employes for the prevention and prompt extinguishment of fires."

With reference to the best spark arresters, it is understood that their degree of efficiency depends on the care with which they are maintained in good condition, and that this care rests primarily on the locomotive engineer.

Extra pains should be taken before dry weather to have rights of way cleared of combustible material. The great Hinckley fire of 1894 was caused by the carelessness of "section men" in burning over a right of way.

The following is a part of Section 12 of the above mentioned Act of April 18, 1895:

"It shall be the duty of all railroad companies operating any railroad within this state to use efficient spark arresters on all their engines and to keep their right of way to the width of fifty (50) feet on each side of the center of the main track cleared of all combustible materials and safely dispose of the same within said limits of their right of way between the fifteenth day of April and the first day of December. No railroad company shall permit its employes to leave a deposit of fire or live coals, or hot ashes, in the immediate vicinity of woodland, or lands liable to be overrun by fires, and where engineers, conductors or trainmen discover that fences or other materials along the right of way or woodland adjacent to the railroad are burning or in

danger from fire, they shall report the same promptly at the next telegraph station that they may pass. In seasons of drouth railroad companies shall give particular instructions to their employes for the prevention and prompt extinguishment of fires, and they shall cause warning placards furnished by the Forest Commissioner to be posted at their stations in the vicinity of forest and prairie grass lands, and where a fire occurs along the line of their road they shall concentrate such help and adopt such measures as shall be available to effectively extinguish it. Any railroad company willfully violating the requirements of this Act shall be deemed guilty of a misdemeanor and be punished by a fine not exceeding one hundred (\$100) dollars for each such offense, and railroad employes willfully violating the requirements of this section shall be guilty of a misdemeanor and be punished by a fine of not less than five (\$5) dollars nor more than fifty (\$50) dollars."

Under Section 9 "any person" who carelessly sets a fire which injures or endangers the property of another is liable to pay a fine of one hundred (\$100) dollars or be imprisoned three (3) months.

Several fires were caused by railroad locomotives during the dry spell last spring. If proper attention is given to this matter by all concerned it is believed that a marked improvement can be made in the record of forest and prairie fires caused by railroad companies.

Very respectfully,

C. C. ANDREWS,

*Chief Fire Warden.*

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### INJURY DONE TO SOILS BY FOREST AND PRAIRIE FIRES.

In reply to an inquiry which I addressed to Professor Harry Snyder, chemist at the Agricultural Experiment Station, University of Minnesota (St. Anthony Park, Minn.), in regard to the injury done to the soil by forest and prairie fires, he replied by letter, dated the 17th instant, in which he states: "I do not think that our farmers, as a rule, are aware of the injury that results from fires." He also communicated to me printed bulletins containing his opinion on this question, from which I make the following quotation:

"Another source of loss of humus in the prairie and forest regions is the frequent burning over of the land. Soils covered with pine, in which sand largely predominates, frequently lose half or three-quarters their total nitrogen when visited by forest fires. The sand, being of an open and porous nature, aids in the more complete combustion of the humus. In the timbered regions of the Northwest the great forest fires of 1894 resulted in the average destruction of over 1,500 pounds





Photo by F. L. Hoxsie.

APPEARANCE OF THE WHITE PINE IN OPEN FOREST, MILLE LACS COUNTY.

of humus nitrogen per acre, to say nothing of the nitrogen lost in the burning of the timber. Analyses of soils, before and after the fire, made by the Minnesota Agricultural Experiment Station showed a loss in some cases of 2,500 pounds per acre of nitrogen, equivalent to a loss of 75 per cent of the total amount in the soil. The prairie fires have not been so destructive upon the humus as the forest fires, because the burning has been confined more to the surface. An average prairie fire, however, will remove more nitrogen from the soil than five ordinary crops of wheat."

Fire wardens should endeavor to disseminate such information as this in their respective communities.

### COMPENSATION OF FIRE WARDENS.

Complaints have been received from a number of fire wardens that the county commissioners have refused to allow their accounts. It was with a view to economy and justice that the law authorized county commissioners to pass upon fire warden accounts. It was not deemed good policy to allow the town supervisors to pay themselves for their fire warden services, even though pay for such services is limited to fifteen days in a year at two dollars a day. Under the circumstances, for county commissioners to arbitrarily refuse to consider and allow the reasonable claims of fire wardens is not only exceedingly unjust to a class of men who, as a rule, cannot afford to give their time to the public, but tends to demoralize and prejudice the fire warden service. Such proceeding by county commissioners is against good example and against true economy. Quite a number of fire wardens have rendered their services without making any charge. Those who do present accounts for services should be duly paid. As the law limits the amount that a county may expend in any one year, under the fire warden law to \$500 (one-third of which is paid by the state), there may be excuse for the county commissioners not approving fire warden claims until the end of the season and when it can be determined whether the five hundred dollar limit has been exceeded; but they are not obliged to wait

until the end of the season. If any claims for services by fire wardens or those who assist in extinguishing fires are not found just and correct it is the duty of the county commissioners to disallow them. But it will be a great abuse of power if they refuse to allow those accounts which are correct and just. As a general rule, fire warden expenses in the various counties have aggregated but a small amount. The state is a large owner of vacant lands, and individual owners of lands contribute in taxes a large amount in the aggregate towards town, county and state revenues; and it is morally just that they should receive reasonable protection against the devastation from forest and prairie fires.

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OPINION OF THE ATTORNEY GENERAL ON THE DUTY OF  
COUNTY COMMISSIONERS.

The following opinion of the Attorney General of Minnesota on the duty of the county commissioners with respect to fire warden accounts, was received by me on the 25th of June, 1897:

HON. C. C. ANDREWS,

*Chief Fire Warden, St. Paul, Minn.,*

DEAR SIR: I beg to acknowledge receipt of your communication of the 25th instant, in which you call attention to General Laws 1895, Chap. 196, and request to be advised, in effect, whether boards of county commissioners can arbitrarily refuse to audit the accounts of fire wardens; if not, of what remedy can the fire warden avail himself?

The Act in question was designed to provide for the protection of the forests of the state against fire, and imposes certain duties upon the various classes of officials therein named. Where a fire warden has been duly appointed, and in good faith performed the services under such appointment, he is entitled, as a matter of law, to the compensation provided by the Act. To be sure, the claimant is not entitled to payment until "he shall have presented an itemized account, and made oath or affirmation that said account is just and correct, which account shall be approved by the county commissioners, when satisfied of the justice of the claim, and left on file with the county auditor."

This implies examination by the commissioners, as in every other case which comes before them involving the expenditure of public

moneys. If they decline to act at all upon such a matter, they can unquestionably be compelled to act by an appropriate proceeding, as for instance, by a writ of mandamus. No court will assume to control their discretion, but it can require them to entertain the matter and either allow or disallow the claim. General Statute 1894, Sec. 644, provides that "when the claim of any person against a county is disallowed, in whole or in part, by the board of county commissioners, such person may appeal from the decision of such board to the district court in the same county," and the procedure is therein expressly pointed out, as you will ascertain by reference thereto.

Generally, the bills presented by the wardens to the board of county commissioners are so small as to render it almost impracticable for the claimants to enforce their rights by judicial proceedings. It is not a question for the consideration of boards of county commissioners whether the law shall or shall not be enforced. The Act in question evidences the policy of the state in such regard, and a board of county commissioners which arbitrarily declines to recognize the bill of a fire warden upon the ground that they deem it inexpedient to enforce the law, would subject itself to very just censure. If a claim is valid, there is no question whatever as to the right of the claimant to enforce it, nor as to the ultimate outcome of his action.

It has been held by the Supreme Court of this state, in the case of *Krushus vs. County of Houston*, 46 Minn., 162, that on an appeal by the county from the decision of the county commissioners allowing the claim against the county, if the claimant recovered part of his claim, costs cannot be awarded to the county. It would follow that if the claimant should succeed in recovering any part of the amount disallowed by the board, he would be entitled to his costs.

It is greatly to be regretted that any board of county commissioners have assumed the position indicated by your communication, and it would seem that if you were to communicate with such board, apprising them of the character of the legislation in question, and the importance of the enforcement of the law, they might be willing to recede from so untenable a position. I am,

Very respectfully,

H. W. CHILDS,

*Attorney General.*



PRESS REPORTS OF FOREST AND PRAIRIE FIRES IN 1897  
IN OTHER STATES.

The following are telegraphic reports of serious forest and prairie fires outside of Minnesota in the autumn of 1897, as printed in the daily press of St. Paul, Minn., and which are inserted here to show the danger that existed in the latitude of this state:

*[From the Pioneer Press, Oct. 3, 1897.]*

PRAIRIES AFLAME.

BAD STATE OF AFFAIRS IN MANITOBA AND NORTH DAKOTA.

Winnipeg, Man., Special, Oct. 2.—Reports of great damage by prairie fires are coming in late to-night from some points. In both east and west telegraphic communications have been cut off by the fires. At Bagot station on the Canadian Pacific, the depot, two elevators and a number of other buildings were destroyed. A bank, hotel and Scott's stables were burned in this city to-night.

Ellendale, N. D., Special, Oct. 2.—A great prairie fire is raging southwest of here. Much apprehension is felt, as it seems to cover a wide territory.

Dickinson, N. D., Special, Oct. 2.—Destructive prairie fires have been raging north of here for three days. The Kildeer mountain has been burned over and many good winter ranges belonging to the large cattle outfits.

Rapid City, S. D., Special, Oct. 2.—The timber fires are still burning fiercely one mile north of Hill City. They have been burning four days. A strong wind is blowing from the north. Miners and citizens from Hill City are fighting hard to keep the fire from the city. It is one of the heaviest timber tracts in the Hills. The loss already amounts to thousands of dollars.

*[From the Pioneer Press, Oct. 5, 1897.]*

VICTIMS OF FIRE.

FATAL RESULTS OF THE FLAMES ON SOUTH DAKOTA PRAIRIES.

Miller, S. D., Special, Oct. 4.—Parties just in from twenty miles north state that as a result of the big prairie fire one man has died and three other people may die. Seven or eight were badly burned; one family of five, named Preston, all being in a dangerous condition. Hundreds of tons of hay, grain, etc., were destroyed. The fire was started by a man making a firebreak.

Jamestown, N. D., Special, Oct. 4.—Owing to the warm and dry weather of the past month, prairie fires have become very frequent and destructive during the last few days. There have been many serious losses along the east side of this county and the west side of Barnes county. Some of the farmers have lost all their grain and many have lost all their hay. Threshing is progressing very slowly, and it is feared that more serious damage from fires will follow unless rain comes soon.

Rapid City, S. D., Oct. 4.—Serious fires have been raging north and south of this place for four days, and the citizens are exhausted from fighting the flames. All night 300 men made a desperate stand against the line of fire approaching from the north. The fire had approached within two miles of Rapid City. It had been burning for four days in the heaviest timbered part of the Black Hills. It was swept toward Rapid City in a solid sheet of flame two miles wide. The woods and prairies are very dry, no rain having fallen here for two months.

St. Lawrence, S. D., Oct. 4.—A severe prairie fire in the north end of Hand county extended into Faulk county. One man will die from its effects, while four tramps, a woman, three children and a man living here are badly injured but will recover. A team of horses and quantities of grain and hay were burned.

[*From the Pioneer Press, Oct. 7, 1897.*]

#### FATAL FIRES IN ONTARIO.

Ottawa, Ont., Oct. 6.—Four bodies have been discovered near South Indian as a result of the forest fires. They are those of Mrs. Le Vielle, Miss Stiles, her sister, and Mrs. Le Vielle's two children, one an infant and the other twelve years old. The women rushed from their house to escape to the clearing, but the smoke surrounding them, they lost their way and ran into the flames. Had they remained in their dwelling house at South Indian they would have been perfectly safe, as it was not touched by the fire. A number of others are missing.

Two or three houses are all that is left of a once thriving village at South Indian. Two houses and a hotel are all that remain of Casselman. The village of Cheney is obliterated. Sixty of the most destitute were brought to this city this afternoon and the others are being provided for at farm houses and elsewhere. Each of the villages had about 500 inhabitants.

[*From the Pioneer Press, Oct. 10, 1897.*]

### EIGHT MORE VICTIMS.

#### WOMAN AND CHILDREN AND A FARMER BURNED IN MANITOBA.

Winnipeg, Man., Special, Oct. 9.—Stories of the awful effects of the late fires still come in at intervals, the report of many fatalities which occurred at a distance having been delayed. The latest tale of horror comes from St. Anne. Mrs. Breanin, a half-breed woman, and her six children met their death on the Dawson road at the edge of the bush. The husband and father was away and it is probable that the poor victims fled panic-stricken from their home, only to be overtaken by the destroying element. Another case is that of a man named Teneau, a near neighbor of the Breanins, who was burned to death in his stable while attempting to save his horses. A farmer at Lorette lost everything he had, escaping barely with his life.

### THREE GREAT FOREST FIRES IN THE NORTHWEST.

The most memorable forest fires which have occurred in the Northwest were those in Wisconsin in 1871, in Michigan in 1881 and in Minnesota in 1894. Forest fires raged in the northeastern part of Wisconsin in the latter part of September and first part of October, 1871, particularly in the counties on both sides of Green Bay. Four hundred square miles of territory were utterly devastated. Of several villages wiped out of existence the principal one was Peshtigo, with a population of 2,000, including those on farm lands in the vicinity, of whom one-third perished in the tornado of flame. On Sunday evening, October 8th, people in that town returning from church services heard "an ominous sound like the distant roar of the sea or of a coming storm," and in a few moments the horrible tempest of fire was upon them. Gov. Fairchild, in a proclamation, stated that the loss of life in the devastated district was at least 1,000; that 3,000 people were left entirely destitute; that mothers were left with fatherless children, fathers with motherless children, children were left homeless orphans, and distress and intense suffering were on every hand. Of private contribution for relief the sum of \$166,789 had been received at the executive office alone at the end of 1871. The dam-





Photo by F. L. Hoxsie.

SECOND GROWTH OF FOREST ALONG RUM RIVER BURNED OVER  
PREVIOUS TO 1895.

age caused by the fires was estimated at \$3,000,000, not including that suffered at Peshtigo.

#### MICHIGAN FOREST FIRE, 1881.

The theater of the great forest fire in Michigan September 5th and following days, 1881, was in the broad peninsula between Lake Huron and Saginaw Bay, in the southeastern part of the state. The fire originated from burning brush in several places where settlers had cleared land, a frequent cause of fires, and, the weather being dry and a high wind rising, it acquired a force which no human agency could check. Forests and fields, farm buildings, orchards, crops and a number of small villages were laid in ashes. "So rapidly did the flames spread that live stock could find no place of refuge. The smoke was so dense that day was turned into night even at a distance from the burning forests, while at other times the whole heavens seemed in flames." The fire ran over forty-eight townships, a belt of timber country partly settled sixty miles in length, north and south, by ten to thirty miles in width, and comprising a million acres. The number of people who perished was 138. The value of property destroyed exceeded \$2,000,000. Hundreds of families were burned out, and the money and supplies contributed for relief amounted to over a million dollars.

#### THE HINCKLEY FOREST FIRE, 1894.

During the drought, July and August, 1894, forest fires were common through the country from Pine county, Minnesota, north to Duluth; likewise in Wisconsin, and the atmosphere became very smoky. The village of Phillips, Wis., was burned by a forest fire July 26th; thirteen lives were lost and very much timber and other property in that and other localities destroyed. The great Hinckley fire originated about three miles southwest of Brook Park, Pine county, Minnesota, from railroad section men letting fires which they had set, to burn around bridges, get beyond their control, and which burned slowly for several days before

the fatal fire. An eye-witness writes: "A strong wind from the southwest fanned the smoldering fires, which developed so great a heat as to immediately ignite green trees and buildings. In fact the atmosphere seemed to be heated to that degree that all inflammable material burst into a flame as soon as the hot wave struck it; thus trees and the whole sides of buildings immediately were in a sheet of flame." Saturday, Sept. 1, 1894, was a sultry day, and but for smoke would have been a clear day. The fire reached and destroyed the village and settlement of Brook Park at about 2 o'clock P. M., the wind then blowing a gale from the southwest. It then seemed "formed in a line about three miles long." Mission Creek was a station and village with a saw mill on the Duluth railroad three miles south of Hinckley. The fire reached and destroyed Mission Creek at 3 o'clock, the wind having been blowing "a hurricane" since 2 o'clock. Sweeping everything in its course, it reached and destroyed Hinckley about 4 o'clock. Of the pathetic scenes, the horror, the heroism, the unutterable distress and suffering which there occurred, it is unnecessary here to speak. The leading facts about the great Hinckley fire are that 418 people, being residents of that place and of the surrounding country, met death in an awful manner; that many of the inhabitants saved themselves by taking refuge in the so-called gravel pit, of three acres in extent and containing a small pond, in the outskirts of the village; that some hundreds more took refuge in Skunk lake, a short distance north of town, being conveyed thither by a railroad train that arrived from Duluth at the time of the fire, and which, having itself caught fire, was consumed by flames very soon after it reached Skunk lake. Its passengers and some of the Hinckley people, after temporary refuge in the lake, walked on towards Duluth and were met and taken thither by another train. Also, quite a number of Hinckley people were rescued by an Eastern Minnesota train, which arrived there at the beginning of the fire from Duluth and Superior.

The number of residents in the Hinckley burnt district, as registered by the relief commission, was 2,045. The material loss, but not including timber, sustained by the people, amounted to \$750,000. The relief furnished to the sufferers through the relief commission, nearly all being from private contribution, amounted to \$184,744.

#### AS TO FUTURE FIRES.

Some may ask, "Will there ever be another great forest fire in Minnesota like that of Hinckley?" I answer that there is an extensive forest region in our state that is yet uninhabited, but frequented by mineral prospectors, timber explorers, land seekers and hunters, and which, under the present limited fire warden system, cannot be watched. Our means for preventing forest fires in Minnesota are not as liberal and thorough as they are, for example, in Ontario, where mounted patrols are employed through dry seasons to guard against forest fires. Our Minnesota fire warden system should be expected to lessen the dangers of forest fires considerably, and has done so, as shown during the dry season in 1896 in the Lake Superior region, but it is not nearly as well provided and sustained as it should be. More especially are we unable to watch the unsettled regions. If in a remote forest locality some careless person leaves a fire, in dry weather, unextinguished, it may smolder for days, and then, being started afresh by a high wind, may spread in the solitude to uncontrollable proportions. So, also, great danger is incurred from new settlers persisting in burning brush in dry weather. These conditions render it important that people be educated to regard our forests as something worth caring for, and that a sentiment of extreme care in preventing forest fires be universally cultivated and respected. Even more than this, that a public sentiment be created which the lawless and stupidly negligent will fear, and which will make prosecutions and convictions practicable. The local press in the timber regions, I would submit, should do its part in creating such a sentiment.



THE MINNESOTA FORESTS AND AMOUNTS AND VARIETIES OF THE  
WOOD AND TIMBER GROWING THEREIN.

Section 3 of the Forest Preservation Act makes it the duty of the Chief Fire Warden to "investigate the extent of the forests of the state, together with the amounts and varieties of the wood and timber growing therein," and to include such information in his annual report. My first and second annual reports contained estimates of standing timber by counties, and it does not seem necessary to repeat the information in this report. I subjoin, however, the following:

SUMMARY.

The estimates for twenty-three forest counties foot up as follows:

Land (acres).....	22,855,000
Forest (acres).....	10,889,000
White pine (feet).....	16,849,000,000
Norway (or red) pine (feet).....	3,417,475,000
Gray (or jack) pine (feet).....	640,000,000
Ash (feet).....	126 100,000
Basswood (feet).....	491,000,000
Birch (feet).....	706,000,000
Cedar (feet).....	1,010,500,000
Elm (feet).....	216,000,000
Maple (feet).....	178,000,000
Oak (feet).....	700,000,000
Poplar (feet).....	475,000,000
Spruce (feet).....	1,050,000,000
Tamarack (feet).....	450,000,000
Ash, basswood, butternut, birch, elm, maple, poplar, spruce, tamarack, etc., not included in separate esti- mates (feet).....	911,500,000
Wood (cords).....	97,480,000

The estimates of the auditors of twenty-nine other counties, which contain more or less hardwood forest, show an aggregate area of 656,000 acres of natural forest, containing 6,000,000 cords of wood; also 45,000 acres of artificial forest, containing 67,000 cords of wood. Twenty-seven other counties, of which some are the oldest settled and some are mostly prairie, may be estimated as aggregating 345,000 acres of natural forest, with 3,450,000 cords of wood; also, aggregating 15,000 acres of artificial forest. The total area of natural forest in the state, according to the foregoing figures, and not including mere brush and swamp land, is 11,890,000 acres.

## SOME FORESTRY FACTS AND PRINCIPLES.

The value of the pine, just as it stands, that is cut in Minnesota in a single winter, in a favorable business year, is \$5,000,000; when sawed into lumber at the mills, its value will have increased to \$10,000,000, of which increase 80 per cent, or \$4,000,000, represents labor; when further manufactured and worked up in various forms its value becomes multiplied. This partly illustrates the value of our forests as an industrial resource. The friends of forestry do not interfere with the cutting and marketing of timber. On the contrary, they wish the industry to be continuous, and a great step in making it continuous is the prevention of forest fires, thereby promoting the natural reproduction of forest on cut-over land. The friends of forestry concede that the private owners of pine land have a right to, and for their financial success must, cut and sell their pine whenever they can find a good market for it. If there are forest areas which the public needs to have kept as forest—for example, at the head waters of rivers to help maintain water flow, or near some beautiful lake for scenery and health—then the public must buy it. The private owners cannot be despoiled of it without remuneration. No! the friends of forestry do not interfere in any way with the rights of lumbermen and owners of timber land. On the contrary, their work increases the value of the lumbermen's property. And inasmuch as the primeval pine will be about exhausted in the course of twenty years, the lumbermen themselves should become active supporters of forestry, do all they can to protect the young timber, encourage timber planting on non-agricultural lands and thus seek to maintain and perpetuate the lumber industry in our state.

Many of the countries of Europe derive a good share of their prosperity from forestry. In Germany 1,000,000 people are supported by forestry, and 2,000,000 more by manufactures of which forest products form the principal material. The little Duchy of Baden, not as large as Pine

county in this state, derives a net annual revenue of \$667,000 from its 240,000 acres of public forest. The Kingdom of Wurtemberg, only a very little larger than our county of St. Louis, derives a net annual revenue of \$1,700,000 from its 418,000 acres of public forest.

The Kingdom of Saxony—which leads all other countries in forestry—from its 430,000 acres of mostly spruce forest, and mostly on poor mountain land, derives an annual net income of \$1,900,000, being \$4.50 per acre. And she is not exhausting her forests. On the contrary, her forests are worth double to-day what they were forty years ago.

The forests of all these countries are not only profitable in a money sense, but they are provided with good roads, are well guarded, are delightful resorts, and not the slightest impediment to the settlement and cultivation of neighboring agricultural lands.

#### LEADING PRINCIPLES OF FORESTRY.

Some of the leading principles of forestry ought to be and easily can be understood by people generally. One of these principles is that the best agricultural land should not be devoted to forest; but that forest should be grown on land that is either too hilly, too rocky or too sandy and light for profitable agriculture. One of the great economic advantages—one of the great beauties so to speak—of forestry is that wood and timber can be profitably grown on soil that is unfit for farming purposes. The forest, by the leaves it sheds, continually enriches the soil; whereas, field crops exhaust it. Let this principle be remembered, that forest is not to appropriate good agricultural land. Wherever there is land now occupied by forest that is well suited to raise field crops it is expected that such land will finally be cleared and used for agriculture. It is, however, a fact, as has been shown by the experience of farmers in the older states, that much forest land is often cleared and put into field crops which is altogether too light and unfit for agriculture,

but which, if left in forest, would continue to yield a good income. Farmers before clearing woodland should dig into and examine the soil. They should look ahead and remember that there is going to be a continually increasing demand for timber.

Another principle in forestry is that the forest must be continuous; that it should always furnish a sustained yield; that no more timber should be taken out of it in a year or in a series of ten or twenty years than grows in the entire forest the same period; so that in a hundred years hence as much can be cut in a year as can now be cut in a year. The forest is to be treated as an inviolable capital and only the interest or income taken from it. Let us take this simple illustration: Suppose one owns 2,000 acres of pine forest which he wishes to maintain as a perpetual income-yielding forest property, he will, according to forest principles, cut on an average only 20 acres a year, taking the ripest and largest trees, and so as to promote reproduction on the cleared land by natural seeding from trees left standing. But if for a series of years the market for lumber is very favorable he may cut a good deal more than 20 acres per year, then, in a series of years of poor market, he probably will not cut any, but he will manage so that for a long period his cuttings will average 20 acres a year. At the end of 100 years' rotation the 2,000 acres will have been all cut, and whoever has the forest then will resume the cutting on the 20 acres that were first cut, and which by that time will have grown to large size. This explains briefly the method of maintaining continuous and regular forest revenue, which is the fundamental principle of forestry. It is well to notice here a great advantage which the forest crop has over the wheat or any other field crop. The latter must always be harvested and marketed when ripe, however poor the market may be, but a forest crop can be left continually growing till the market is favorable.

Another principle of forestry is that the cutting of timber should be in blocks or strips so as to facilitate reproduction of timber on the cleared areas by seeds falling from the trees left standing. This is a more economical way of reforestation than by artificial sowing or planting. Sometimes, however, there is need of artificial help in preparing the land for the seed or in planting or sowing here and there a patch to effect a sufficiently dense growth.

Another principle is that a forest when young must have, in numbers, vastly more trees than when it is mature. A tree grown in the open may be handsome and useful for shade, but it is useless for timber. To make good timber, a forest, when young, must be crowded so as to secure height growth. In such situation there is a survival of the fittest. A struggle—a continual battle—goes on for supremacy, just about as in a human life. The weak ones succumb and perish; the strong ones tower aloft. In dense young forests the trees shed their branches or scarcely have any except near the top, and there is a lofty height growth of clear timber. A piece of mixed woods, managed on forestry principles in the Black Forest of Germany, has per acre at the age of 20 years, 3,960 trees; at the age of 40 years, 1,013 trees; at the age of 60 years, 449 trees; at the age of 80 years, 346 trees; at the age of 100 years, 262 trees. The decrease is sometimes partly effected by artificial thinning.

The fact is recognized that the most of the pine forest in Minnesota is now owned by private parties, who must, for their financial success, cut and sell their timber just as fast as they find a good market for it. In frequent cases they have built branch railroads into their forests, which they must take up as soon as the cutting and hauling are done. Hence they cut clean, even though some of the trees are not more than a third part grown. The practice is sometimes different in pineries bordering water courses, which afford a permanent cheap means of getting the logs to mill. In such pineries the proprietor can leave the younger trees



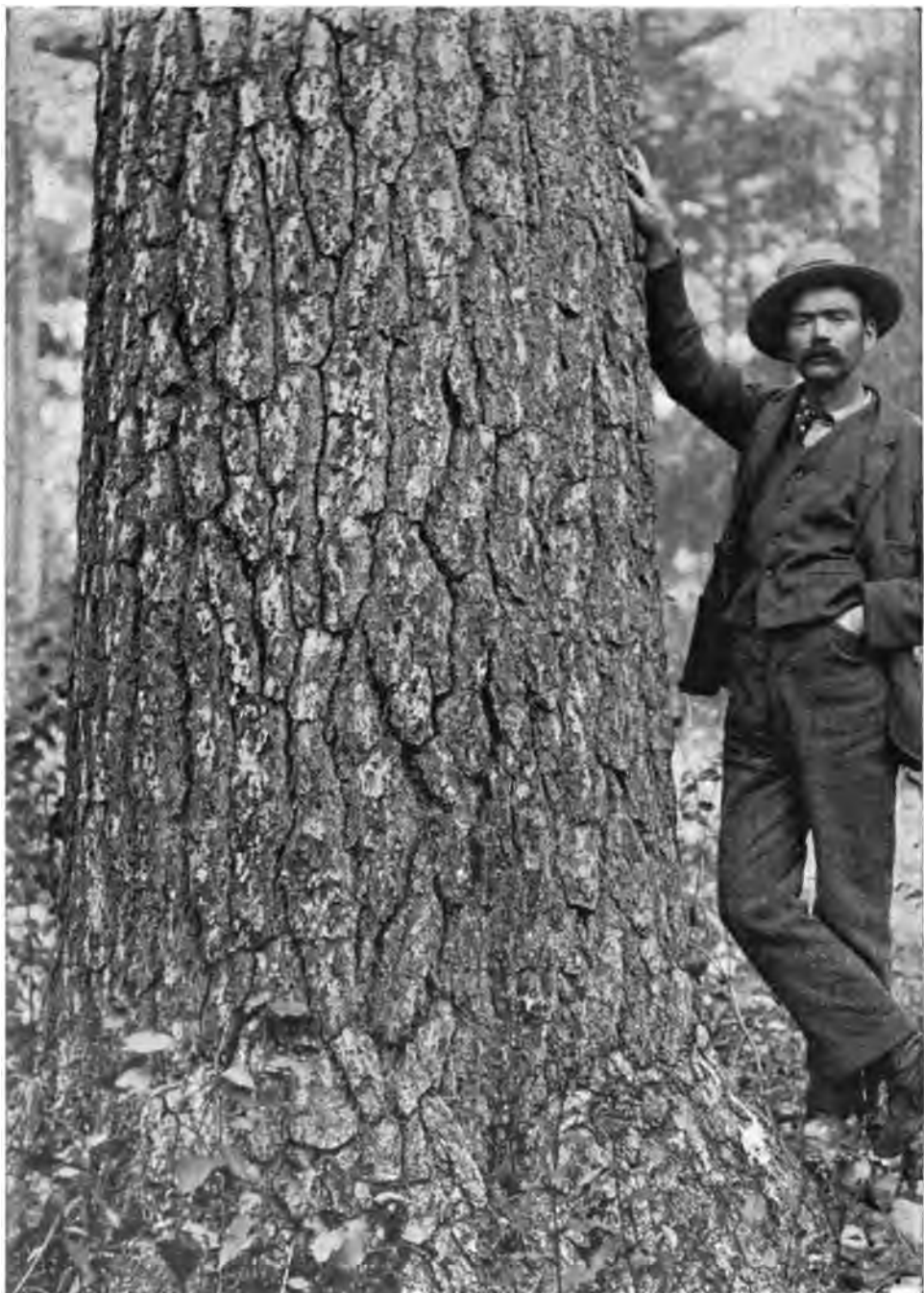


Photo by F. L. Hoxsle.

**SECTION OF A WHITE PINE TREE FOUR FEET SIX INCHES IN DIAMETER, NEAR  
THE VILLAGE OF COVE, MILLE LACS COUNTY.**

to grow, and he can come back for them after an interval of some years. With the magnificent remnant of primeval pine the state has nothing to do except to aid in preventing its destruction by fires (and which in honor it is bound to do, since the pine land owners pay taxes for the protection of their property); or possibly the state should, before it is too late, buy and hold a few tracts of this virgin pine for parks.

Our best white pines have been growing from 100 to 200 years; and although merchantable pine, but not of the best quality, may be grown in 60 years, there are but very few individuals willing to wait so long for a crop; and if anything important is to be done to renew and perpetuate our forest wealth, it must be done by the state, or through the inducement it offers through the reduction of taxes or in some other form.

#### THE FORESTING OF WASTE LANDS.

It is more profitable to raise forest from natural seeding, but where land has been entirely cleared, forest of pine and spruce can be renewed only by artificial planting or sowing. There are in Minnesota several million acres of waste land unfit for agriculture, and now totally useless, but which might be made to yield a rich revenue to the state if planted with forest.

The celebrated Scotch forester, Mr. James Brown, in his great work, "The Forester" (the fourth edition of which was published 27 years ago), states it as a general rule, verified by his own experience in England and Scotland, "that land which is from various causes unfit for high farming, will, under wood, at the end of 70 years, under good management, pay the proprietor nearly three times the sum of money that he would have received from any other crop upon the same piece of ground." He cites numerous instances of pine and larch crop that grew to a value, in 70 years, of \$500 and upwards per acre, being an increase



of over \$7 per year. The most recent English writer on forestry, Dr. William Schlich, in his *Manual of Forestry*, says that it pays  $2\frac{1}{2}$  per cent compound interest per annum to plant Scotch pine on land of third quality, provided the land can be purchased for \$62 per acre. In a recent most interesting and valuable address on "Forest Finance," by C. A. Schenck, Ph. D., superintendent of the forest department on Mr. Geo. W. Vanderbilt's estate at Biltmore, N. C., it is shown that, computing from the yield tables for German spruce, a plantation of spruce made on abandoned farm lands or cleared wood lands in this country, will contain, when 60 years old, about 45,000 feet (board measure) per acre, worth standing not too far from market, about \$3.63 per 1,000 feet; or for the whole acre's crop, \$163.39. The cost of planting an acre with spruce on the Biltmore estate he has found to be as follows: Three thousand plants per acre, two years old, \$5; planting in plow furrows about three feet apart, \$8 per acre; miscellaneous expenses, such as tools and supervision, \$2. In all, \$15 per acre. "Of these 3,000 plants about 500 will attain an age of 40 years, and about 300 an age of 60 years." This capital of \$15 will amount in 60 years, at  $3\frac{1}{2}$  per cent compound interest, to \$118.20. But there are a few other items of expense incident to the production of this acre of spruce; namely, taxes on the land estimated at 3 cents per annum, amounting in 60 years to \$5.89; interest at  $3\frac{1}{2}$  per cent on the value of the land, say, \$4, 14 cents per annum, amounting in 60 years to \$27.51. Where planting is done on a large scale, the employment of a watchman or ranger will be necessary, with salary, say, \$600 a year. "Ten thousand acres is a good sized range, and thus the expense for watching per acre per annum will be about 6 cents, and will amount in 60 years to \$11.79." These three items together, of taxes, interest on value of land and expense of watching, amount to \$45.19, which, added to \$118.20, gives

the sum of \$163.39—being the same as the estimated value of the timber grown in 60 years on one acre.

This example shows that plantations of forests systematically made in this country on a large scale will net  $3\frac{1}{2}$  per cent on the capital invested. Certainly they ought to net that rate of income where the land cost practically nothing, as in the case of lands acquired by the state for non-payment of taxes. In planting a thousand acres with forest at the rate of expenses specified by Dr. Schenck, \$9,000 would be expended for labor. Dr. Schneck, who is an accomplished practical forester, lays down this rule: that making plantations of forests pays "where the aggregate expenses for plants, planting, supervision, interest on real estate, taxes and protection, accumulated with compound interest may be expected to be less than the expected yield or stumpage," and he insists that such investments of capital are safer than in savings banks, and more profitable than the best government bonds. Two inferences, he says, may be derived from the examples given: "First, that only such people should invest money in forest plantations as can get along without cash returns from the investment for a number of years; second, that there is nothing in the world yielding compound interest so regularly and surely as forestry, and therefore forestry is the best savings bank."

The State of Minnesota holds about 200,000 acres of land which was forfeited for non-payment of taxes, and which, at present, is of no use to any one. Probably there are 3,000,000 acres of land in the state, in scattered areas, that is unfit for agriculture, and upon which, in its present situation, no taxes will ever be paid. Much of it is now held by the general government, which, no doubt, would relinquish its title to it to our state on its undertaking to utilize it in a systematic manner for forestry. The most of it, without doubt, will produce white pine, or some other sort of profitable timber. It is utterly out of the question for individuals to plant this waste land with forest; but the state can do

so, and if it would, what a magnificent patrimony it would possess. To those who have not considered the subject the beneficial results of foresting our waste and non-agricultural lands will seem incredible. Fifty years ago who would have believed that the proceeds of our state school lands would now amount to the princely sum of \$13,000,000, yet such is the splendid fact.

#### FOREST MAINTAINS WATER SUPPLY.

Fifty years ago the American naturalist, Henry D. Thoreau, writing in "The Maine Woods," said: "The primitive wood is always and everywhere damp and mossy, so that I traveled constantly with the impression that I was in a swamp." Again he says: "The surface of the ground in the Maine woods is everywhere spongy and saturated with moisture." This country has not produced many wiser or more learned men than George P. Marsh. From his boyhood he was acquainted with the woods, and in his "Man and Nature," he repeatedly maintains that the forest is the great reservoir of moisture in expressions like the following: "The protection afforded by the forest against the escape of moisture from its soil, insures permanence and regularity of natural springs, not only within the limits of the woods but at some distance from their border." He quotes William Cullen Bryant as saying: "Fifty years ago large barges loaded with goods went up and down the Cuyahoga river; now in an ordinary stage of the water a canoe or skiff can hardly pass down the stream." That veteran advocate of forestry, Mr. Joseph B. Walker of New Hampshire, wrote in 1893: "The most important and valuable function of the White Mountain forest region is its office as a great natural reservoir for the storage and distribution of water." Dr. William Schlich, formerly Inspector General of forests to the government of India, and who for twelve years has been the principal professor of forestry at the Royal Indian Engineering College, Cooper's Hill, England, in the first volume

of his Manual of Forestry states that forests "help to regulate the water supply, insure a more sustained feeding of springs, tend to reduce violent floods, and render the flow of water in rivers more continuous." Indeed everyone who has been in a forest knows that its soil is more moist, soft and porous than that of bare land. The roots of the trees and the layers of mould formed by the decomposed leaves serve as a natural reservoir, calculated to retain a large quantity of rain and admit of its gradually supplying the little rivulets which go to form brooks and rivers, and thus for a long time maintain the supply of water in rivers for navigation, for water power and for fertilizing contiguous soil. On the other hand, water that falls in heavy rains on cleared hill-sides rushes down tumultuously, washing away the soil, tearing away bridges, undermining roads, and sometimes inundating towns and destroying life. On account of the great influence of forests in maintaining and regulating water supply in streams, it is now recognized in all countries as a sound principle that the state should own or at least control forests on the head waters of important rivers. Such ownership or control, however, is not, as a rule, inconsistent with a regulated cutting of merchantable timber, because a regulated cutting implies cutting with a view to care of young trees, natural reproduction and a continuation of the forest. This is a leading principle of forestry, which ought to be well known by the public and seasonably acted upon by the legislature. The economizing of our water power is a matter of first rate importance.

Minnesota is having experience similar to that of New York in the diminished flow of rivers. In 1884 the State of New York appointed a commission, of which Prof. Charles S. Sargent was chairman, to investigate and report on the preservation of the Adirondack forests. They made a careful report January, 1885, and among other matters which they discussed was the influence of those forests in maintaining the supply of water in important streams, and as

their observations are applicable to the important rivers in Minnesota, which have their sources in our northern forests, I quote from their report as follows:

The most important function of the Adirondack forests is found in the influence which they exert upon the streams heading among the hills of the Adirondack plateau, which distribute the heavy rainfall of this region. As reservoirs of moisture these forests are essential to the continued prosperity of the state; as such they are properly an object of interest to the whole community. Their influence is felt far beyond the limits of the state, and their destruction must be followed by widespread commercial disaster.

The Hudson river, born of many mountain streams, flows in rapid course down the steep southern slopes of the Adirondack mountains. The Mohawk is largely fed by the streams in the southwestern portion of the plateau. Many streams, important to the people of the state, in the aid they bring to great industrial enterprises, although of less general importance and far-reaching influence than the Hudson or the Mohawk, flow out from the Adirondack forests to the St. Lawrence. It is not necessary to discuss here the question of the influence of the forests upon the flow of rivers. Science long ago pronounced upon this subject, which now, moreover, seems to be fully understood in all its bearings by the people of this state. The future of the rivers which flow from the Adirondack plateau may be judged by their past. Great changes have been noticed in these streams since the area of the Adirondack forests has been materially reduced. All the testimony which the commissioners have been able to collect upon this subject indicates that the summer flow of the Adirondack rivers has decreased within the memory of men now living from 30 to 50 per cent. Many of the small streams, which a quarter of a century ago were abundantly supplied with water during the entire summer, are now usually dry during many months. It is reported by competent observers that the flow of all the Adirondack streams becomes uncertain and irregular every year, and that the damage from spring floods and summer droughts is increasing. This is the effect of forest destruction in the past. The evil may be expected to increase under the existing condition of affairs more rapidly in the future than it has increased in the past.

Around the tributaries and headwaters of the Mississippi, Rum and St. Croix rivers, lumbering has been carried on for the past fifty years and the volume of water in these and other streams has diminished in consequence of the clearings. This New York report is about as applicable to our





Photo by F. L. Hoxsie.

POKEGAMA FALLS, MISSISSIPPI RIVER; A PART OF THE U. S. RESERVOIR  
DAM IN SIGHT, ITASCA COUNTY.

condition as if it had been made under the authority of our own state.

### FORESTRY IN THE PUBLIC SCHOOLS.

If the pupils in the public schools could be made acquainted with the leading principles of forestry it would help to form a most useful public sentiment on the subject. Teachers have been willing to impart such information, but they have not always had it at hand in convenient form. It was partly to supply such a lack—and rather as a diversion and recreation than as a new study—that Professor Samuel B. Green, of the University of Minnesota, by request, furnished his “Outlines of a Few Lessons in Forestry,” as a paper before the county superintendents of schools at the meeting of the State Educational Association, last winter. These lessons will enable a teacher, in an easy and pleasant way, to interest pupils in the great truths of forestry, which so deeply concern the welfare of our state; and believing that an intelligent public sentiment in regard to our forests will promote the exercise of care in preventing forest fires, I, with the approval of the State Superintendent of Public Instruction, furnished, through county and city superintendents, each public school teacher with a copy of Professor Green’s lessons in season for Arbor Day, and in form of the following circular:

C. C. ANDREWS,  
*Chief Fire Warden.*

R. C. DUNN (State Auditor),  
*Forest Commissioner.*

CIRCULAR NO. 10.	}	STATE OF MINNESOTA. OFFICE OF CHIEF FIRE WARDEN, ST. PAUL, MINN., Arbor Day, April, 1898.
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The following paper is published, with the consent of its author and with the approval of the State Superintendent of Public Instruction, who regards it as strictly in line with the elementary science work now being done in many of our best schools, for the information and use



of teachers of public schools, who are requested to have it preserved as a part of the permanent records of their respective schools.

Very respectfully,

C. C. ANDREWS,

*Deputy Forest Commissioner and Chief Fire Warden.*

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## OUTLINES OF A FEW LESSONS IN FORESTRY.

By SAMUEL B. GREEN,

*Professor of Horticulture and Forestry, University of Minnesota.*

Read before the County Superintendents' Section of the State Educational Association, 1897.

I recognize the fact that our rural schools are often much behind in the instruction given in reading, writing and arithmetic, and that these studies must receive the first attention of the teacher. But I think very often that these essentials would be taught very much better if the teacher were able to interest the pupils in the every-day changes that are going on in nature in their immediate vicinity. This is nature study, and I regard it, when properly taught to children, as a recreation and in no sense an increased burden, since children are naturally interested in such matters. It is under this head that I would put forestry and ask a few moments to call your attention to some of its claims to your consideration.

Forestry includes directly the study of the laws that govern the growth of trees, their application and the consideration of all the factors that enter into the growing and marketing of a crop of trees and indirectly it deals with the effect of forests on water supplies and on climate. This makes it a study of much breadth and importance, but here I wish to discuss only the possibility of teaching a few of its simplest and most evident phases. However, before I refer in detail to this matter I wish to call your attention to some general features with the forestry situation in this state.

We have here two forest problems; one of which concerns the profitable management of large areas of valuable timber trees, and the other the planting of windbreaks and shelter belts on our prairies.

Much attention has been given to the study of the best kinds of trees, and the best ways of planting and caring for trees on the prairie, and even though this matter is still in a very crude state, considerable progress has already been made.

But the problem of the management of our timber lands to get the most out of them has never received much attention in this country and we are, generally speaking, working our forest resources as we would a mine; that is, as though they could never be renewed. It is not entirely the fault of our lumbermen that such a condition exists, but it is largely due to our people having incorrect ideas of the rate of increase on growing trees and to their careless use of fire. The lumbermen have studied this problem and have concluded that it will not pay to hold their timber lands for a new growth because of the danger of its being destroyed by fire. On account of this great risk large areas of cut-over land have reverted to the state for taxes and are now almost entirely uncared for and yield nothing to the state or individual. I estimate the area of this

class of land in this state at close to 3,000,000 acres. In St. Louis county alone it amounts to at least 427,099 acres. Such land is either too poor for farming or will not be needed for farming purposes for many years.

Again, the State of Minnesota owns or will own when the surveys are completed about 3,000,000 acres of land, the most of which is timbered. But no care is taken to get the most out of this for the benefit of the public school children for whom it is largely held, except that of late years the state auditor has been looking after cases of theft. Some of this land has a young growth of pine on it that if protected from fire would earn 20 per cent per year for twenty years, yet such pine has been sold and the returns invested in bonds bearing 3 per cent.

I know a school section which to-day is considered almost of no value. It is covered with a young growth of pine overtopped by aspen. If it continues to increase for the next twenty years as it has in the past, and this is a reasonable expectation, the timber on it will then be worth \$102 per acre, and yet the chances are it will never be cut unless proper precautions are taken to protect it from fire.

Until the forest fire law of 1895 was enacted we had no adequate law to prevent forest fires, although fires had destroyed far more timber than the lumbermen had ever cut. And we should not have gotten the law at that time but for the terrible and entirely preventable Hinckley fire, wherein over 400 people lost their lives and an immense amount of valuable property was destroyed. This law has had a most excellent effect in preventing fires and is often referred to in other states as a model law, and yet there are many well-meaning people who think it of no importance.

But such lack of proper management of our forest resources, although about as good as that of any of the states west of New York, is evidence of a lack of knowledge of its possibilities for yielding a continuous revenue.

It has seemed to me that I could best give you an idea of the practicability of doing some elementary work in forest instruction in our public schools by citing some twenty subjects for lessons that would bring out a few of its most essential features:

## LESSON I.

*Characteristics of Some of our Common Trees.* In some of our district schools a little attention is now being given to the subject of elementary botany. It seems to me that the botany of our trees could be made more interesting if it were supplemented by the study of the value of a tree for ornament, for fuel, etc.

Suppose that the lesson was on the Soft Maple; study the leaves, twigs, and other parts as is now done but in addition, let each pupil make inquiries of friends about the hardiness of the tree and the value of its by-products. It would be found that the soft maple grows naturally on river bottoms and attains the largest size on land that is occasionally overflowed, but that on high prairie it is likely to suffer from drought. The seeds ripen in June, are large, have a wide wing to aid in distribution, and grow if planted as soon as fallen. The wood is rather hard when dry and makes good flooring and summer fire wood. Maple sugar can be made from the sap, but twice as much sap is required as from the Sugar Maple to make the same amount of sugar. The tree is likely to be broken in the branches if growing in an exposed place. If pruned

occasionally, this would not happen, because the shorter branches do not exert the leverage of long branches. Similar lessons could be given on any of our trees.

### LESSON II.

*The Willow* could be studied and the pupils would gladly look up the different kinds in the vicinity and perhaps could find out the common names of them. In the prairie sections, the White Willow is very desirable for a windbreak, as it is hardy against drought and cold and grows easily from cuttings. A scholar whose parents had had some experience in raising willows might be given the privilege of reporting on the best methods of growing them. The trees are often liable to the attacks of the saw-fly which eats off the leaves. This might lead to a short study of this insect and methods of combatting it, many of which are well known.

The lack of information about trees among our people is well illustrated by the experience this summer of one of the teachers in charge of a summer school who told me of an instance where the owner of land near a highway had grubbed out some large Bur Oak trees in front of his house, and planted Box Elder trees seven feet high in their place. It seems almost incredible that a man would grub out a fine Bur Oak and plant a Box Elder in its place. The former is significant of long life and endurance, while the latter, though a good tree, is comparatively short-lived and not nearly so stately nor so hardy. It seems to me that it would not be difficult to give correct ideas on such matters in our schools.

### LESSON III.

*Benefits of Properly Placed Shelter Belts and Groves.* Several points may be brought out here; for example, protection from wind, thus lessening the amount of evaporation from soil to leeward. The results of some experiments to determine the comparative amounts of evaporation during winds of different velocities, showed that evaporation with the wind traveling at the rate of 10 miles an hour was 3.8 times greater than in a calm; at 20 miles it was 5.7 greater, and at 30 miles it was 6.3 times greater than in a calm atmosphere of the same temperature and humidity. Professor King has shown that a windbreak 20 feet high appreciably prevented evaporation for a distance of 300 feet. Windbreaks also protect from dust storms and from hot and cold winds. In this way they add to the comfort of the inmates of the buildings and make less fuel, food and clothing required. It is far more comfortable to work to the leeward of a windbreak in cold weather than out on the open prairie.

The snow is also held in place by windbreaks and prevented, under the shade of trees, from melting very rapidly, and in this way the snow water has a better chance to soak into the ground and feed our wells and springs.

The distance to which windbreaks protect to leeward should be made a subject of special investigation by the pupils themselves. They can easily get the information desired by noting the distance to which the snow is drifted by any object that obstructs the wind. Even a barbwire fence has an appreciable effect. The distance to which this influence extends is largely governed by the height of the obstruction. Investigations seem to show that a windbreak affects the force of the wind for from sixteen to twenty feet for each foot in height, and probably the pupils' observations would confirm this.

## LESSON IV.

*Disadvantages of Trees in Some Places.* Treeplanters sometimes blunder by setting trees in improper places. For example, the planting of a windbreak near to the side of a roadway may drift the snow too much into the road. A windbreak on the north and west sides of a building, especially near doors, may be objectionable in causing a snowdrift where it is a great inconvenience. I know of one person who condemned all windbreaks after an experience of this kind in 1888, when he found it almost impossible to keep the snow away from his door. In this case, if instead of planting the windbreak so close, he had planted it 100 or 200 feet distant and set out a few scattering trees in the intervening space, he would have had no cause for complaint and would have received the full benefit of the windbreak. It would be well to have the same points in mind in planting a windbreak to the windward side of land wanted for early planting in the spring.

## LESSON V.

*The Functions of the Various Parts of a Tree.* The pupils should be given a slight idea of the means a plant uses to get food; *i. e.*, that the roots take up water with mineral substances in solution from the soil and the leaves take in food from the air. These are assimilated in the leaves and supplied to the tissues of plant for growth. Several lessons could profitably be given on this subject.

## LESSON VI.

*Transpiration.* An object lesson in estimating the amount of water given off through the leaves of a plant can be easily given. Get a young sunflower or other actively growing plant started in a pot; stop up hole in the bottom of pot, water well and cover the whole pot up to stem with rubber cloth to prevent evaporation from the soil or the sides of the pot. Carefully weigh the plant and then allow it to stand in sunlight until the leaves show signs of wilting. Weigh again and note that the difference in the two weights is the amount of water given off through the leaves of the plant. A large sunflower plant has been known to give off three pints of water in one day. Large Cottonwood trees may give off from one to two barrels of water a day during most active growth in hot weather. The trees on an acre of ground, while they give off less than agricultural crops, may transpire from 500,000 to 1,500,000 pounds of water during one growing season.

*Another Object Lesson on Transpiration.* Note where dew is formed at night. All the older physicists give as the origin of dew the cooling of the atmosphere which precipitates the water it cannot hold upon cool objects in the vicinity. While this has some truth in it yet it will not account for the greater amount of dew on the leaves of living plants. The attention of the pupils might be called to the fact that when walking through a field of stubble in the morning their shoes would be wet but very little, perhaps not at all, but in going through clover there would probably be a sufficient amount of dew to thoroughly soak their shoes. This water is brought from the ground through the plant tissues, is forced out through the cells, and is condensed by the cold air on the surface of the leaves. Stubble, which is dead, does not throw off water as clover, which is alive and active, with its roots penetrating into the subsoil, and so has but little if any water on its leaves.

## LESSON VII.

*The Seed, a Miniature Plant.* To illustrate this, perhaps no better seed could be found than the Soft Maple when just starting into growth. It may also be shown in this or another lesson that no two leaves, twigs or branches of any tree are exactly alike and that plants are infinitely variable.

## LESSON VIII.

*Special Appliances for Distributing Seeds.* Attention might be called to the seed of the cottonwood, which has cottony float on its seed which enables it to be blown great distances by the wind. The Elm, Ash, Box Elder and Maple have wings which answer the same purpose. Where Locust is found, attention could be called to the fact that the seed pods remain on the tree into the winter and that, when they open, the seeds are thrown quite a distance from the tree. The fruit of plums and cherries is often carried for a distance by birds or squirrels and after the pulp is eaten the seeds are thrown away. Pupils unconsciously distribute seed in the same way.

## LESSON IX.

*Effect of Slope on Tree Growth.* In hilly sections, as along the bluffs of the Mississippi river, it could be plainly shown that a northern slope offers far better conditions for tree growth than the southern slope. The south sides of the bluffs are often entirely bare of trees while the north sides are generally thickly wooded. Some reference might be made to the comparative advantages of eastern and western slopes. The main reasons why the northern or northeastern slopes are the best might be given that they do not receive the direct rays of the sun, or the hot dry southwest winds, and therefore the soil does not dry out so quickly, the trees are not so liable to sunscald and seedlings start much more readily on them than on a southern or southwestern slope.

## LESSON X.

*Certain Trees Form their Flower Buds in the Fall.* Illustrate by cutting off branches of Cottonwood, Aspen, Poplar, Soft Maple, Box Elder, Hazel or Willow in the winter or early in the spring; bring them into a warm room and place their stems in water. The flower buds will open in a short time. Note that there are two kinds of buds, leaf and flower buds. Note also that their growth is made after a branch is cut from the tree, thus showing that the branch contained a sufficient amount of stored-up food to start the buds into growth. A plant is not like an animal in that one part will not grow when separated from the whole.

## LESSON XI.

*Effect of Soil on Kind and Quality of Tree Growth.* In sections where there is a variety of soil and elevations, a lesson might be given in studying the relation of trees to soil. This might be supplemented by inquiries made elsewhere. It would probably be brought out that willows and poplars grow on very wet soil, that the Black Walnut is found on moist, deep, rich soil and the Hard Maple on rich, clay soils of a rather open character. In the northern section it could

be easily shown that White Pine grows on good soil and gets ahead of every other evergreen on that land. On rather poor land the Norway Pine would get ahead of the White Pine, and on very poor land the Jack Pine will crowd out either one. Bur Oak and species of the black oak class are often found on very dry, gravelly hills. These examples are sufficient to show that the growth of trees on land is a fairly good index to its value for agricultural purposes.

#### LESSON XII.

*Effect of Trees on Land near them.* It should be generally known that trees differ in the nature of their root systems. Some trees, such as Bur Oak and Black Walnut and to some extent the Maple and Ash, do not have many surface roots while the Cottonwood and Willow have a large number. On this account grasses or other crops will grow vigorously close to the trunk in the shade of a Bur Oak when they would not near the Cottonwood. The latter seems to take all the moisture and plant food out of the soil so that it is difficult for any of the better agricultural crops to survive near them. This was called to my attention recently in observing the yields from different parts of a field of potatoes. Under an Oak the potatoes yielded well nearly to the trunk while under the Cottonwood the potatoes were so small as to be of little value.

#### LESSON XIII.

*Tree Trunk.* Take the trunk of a tree for a lesson. Show how the wood grows by the addition of a ring on the outside each year and the bark grows by the addition of a ring to the inside each year; that the cracks in the old bark are the result solely of the tree outgrowing its old bark clothes. Show also that the new growth is spread over the entire surface of the tree and that the bark and wood of the roots, branches, branchlets and twigs are made up of annual rings. Note sapwood and heartwood and difference in color and explain that there is active sap flow in the sapwood and very little sap flow in the heartwood. Analyze a young tree trunk by cutting it up into sections showing the length of each year's growth and show then that each year's growth is conical in form. Note that the rings of trees vary in thickness and that they thus show the history of the tree. For instance, a very thin ring may indicate a very dry season or an attack of grasshoppers, caterpillars or other injury. It is often interesting to note the connection between such data and to compare the known age of trees with the age estimated by the number of rings.

#### LESSON XIV.

*Products of the Forest.* Some of these are lumber, fuel, wood pulp for newspapers and other purposes, cork, bark for tanning, maple sugar, spruce, gum, wild fruits and nuts, resin, turpentine, essential oils and various medicinal products.

This lesson may be divided and very much enlarged upon at the convenience of the teacher. The various uses of wood might be considered and each scholar be required to make out a list of the uses of wood and perhaps give a list of hardwoods and of softwoods.

## LESSON XV.

*Sunscald.* Trees may be injured by sunscald. By this is meant the injury which occasionally results in killing the bark on the southwest side of trees. This is also a common cause of death to Apple trees, as was the case last year with many Basswood, Box Elder and Maples. In this lesson the teacher should call attention to the fact that such injuries are common and always occur on the southwest side of trees and only on those parts that are exposed to the sun. Where the trunk is shaded, as in forests, it never occurs. The remedy then is to shade the trunks and larger branches of our shade trees. If there were time it could be shown how this injury probably occurs and a lesson could be drawn with illustrations and original simple studies to show that one part of a tree may start into growth independently of other parts.

## LESSON XVI.

*Injuries to Trees by Fires.* Explain that even small fires may injure the bark of trees although it may not kill them; that when fires occur in the spring they often destroy the young seedlings that are just pushing out of the ground; that they burn up the dead leaves and leaf mould which the trees delight in; that the careless use of fires in forests has destroyed many lives and an immense amount of property. Give the history of the conditions that led to the Hinckley fire of 1894, and of some very injurious prairie fires.

## LESSON XVII.

*Heat Absorptive Qualities of Differently Colored Substances.* Note the way in which snow melts from around dark objects, such as stems of bushes, trunks of trees, etc. A good way to illustrate this is to melt a drift of snow by sprinkling dark colored earth over it on a clear day. This is a common practice among market gardeners to melt snow around hotbeds and buildings.

## LESSON XVIII.

*Where Trees are Most Abundant.* Refer to the fact that forests are found skirting the sea line and following the larger watercourses over the entire earth; that the interior continental climates are dry and have treeless plains or deserts. This might be shown by maps of Europe, Asia, Africa, South America, North America and Australia. Show how within the boundaries of Minnesota is found, (1) the heavy timber lands; (2), the borderland of the great eastern continental forests with its scattered out posts of Bur Oak and Black Oaks and (3), the commencement of the great prairies where trees find great difficulty in keeping ahead of the grasses and sedges. Show also that trees follow the watercourses into the prairies in this state.

## LESSON XIX.

*Why Prairies are Treeless.* It seems to be important to give correct ideas to pupils in regard to this matter, and a good way to show it is by reference to the previous lesson (XVIII) and then explain that there are places in western Dakota and in the foothills of the Rocky Mountains where trees cannot be grown because it is too dry for them, while in eastern Minnesota and Wisconsin the trees grow naturally. Between these two extremes there must be a

section where a little assistance given in starting the young trees would aid in establishing a growth of trees. For this reason trees may sometimes be grown on prairies when planted and cared for where they would not grow if left to themselves. This could be illustrated in a small way by citing instances where woodlands skirt the streams and extend for a short distance into the prairies, where the soil is moist, while back from the river bottoms groves require some cultivation in order to have them do well. Attention should also be called to the fact that immense herds of buffalo once roamed the prairies and that the Indians burned the grass and the woods near the plains to make pasturage for the buffalo, and in so doing they to some extent forced the tree line eastward.

## LESSON XX.

*Trees for Prairie Planting.* In too many instances tree planters on prairies have put out only quick growing, short-lived trees, such as the Cottonwood and Lombardy Poplar, and after fifteen or twenty years they have found their trees dying and nothing coming on to take their places. These quick-growing kinds are very desirable as a protection for the near future, but they are often short-lived and should never be planted alone. Among them should be planted a sufficient number of long-lived and perhaps slower-growing kinds to afford protection in later years when the short-lived kinds have died out. The soil and location have much to do in determining the longevity of varieties; for instance, the Cottonwood and Lombardy Poplar are generally short-lived trees in this section, but when planted in locations where their roots reach the permanent water level their period of life may be considerably lengthened.

In starting a grove or windbreak on the prairie in this section, there is probably no better tree to begin with than the White Willow. It is quick growing, rather long-lived in most situations, makes good summer fuel and renews itself very readily from the stump; the Green Ash would probably rank next as a pioneer tree. The White Elm is also very valuable for this purpose, but generally should follow the White Willow. The Cottonwood may sometimes, though very seldom, be the best tree to use, but on average prairie land it would be better if the White Willow or Green Ash were always planted in its stead, and the Box Elder is a much better tree for general planting. The Basswood is an excellent tree for prairie planting. After a good windbreak has been secured it is safe to plant out the hardy coniferous evergreens and such trees as the Mountain Ash, European White Birch and other similar ornamental trees. Wind protection is beneficial to all trees and necessary for many of our best ornamental kinds and often makes the difference between success and failure in growing them.

*Distance Apart to Plant.* In the planting of groves we should aim to get the land shaded by the trees as soon as practicable and to keep it covered with a canopy of leaves, but should cultivate thoroughly until this condition has been reached. The United States government recommended the planting of trees four feet apart each way with the idea that when so planted they would quickly shade the ground and consequently keep out grass and prevent extensive evaporation. Some successful plantings have been made on this plan, but when planted so closely together the branches grow into the rows after a few years and before they give sufficient shade to kill out grass cultivation



must be discontinued. In this section, where we have so much very bright, sunshiny weather, grass can grow under foliage that would kill it out in a more humid climate. This is especially true of such trees as the Cottonwood, Lombardy Poplar and White Elm when planted alone, as they have open foliage that does not furnish a dense shade. On this account, among those who have had large experience in prairie planting there has been a tendency of late years to plant two feet apart in rows eight feet apart and some of our most successful planters prefer even more room than this between the rows. When plantings are made 2x8 feet the same number of trees are required for an acre as when planted 4x4 feet, but the former distance has the advantage over the latter in that the space between the rows can be cultivated for perhaps ten years or more, by which time most trees will have formed a dense shade, be able to take care of themselves and keep out the grass. When a much greater distance than eight feet is allowed between the rows we generally fail to get forest conditions for many years and to that extent fall short of an important condition in prairie planting. The distances given here might need to be modified to suit different varieties and local climatic conditions.

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### EUROPEAN FORESTRY.

One of the best, though indirect, ways for preventing forest fires is the diffusion of popular information on forestry. When people know what forestry is, how precious in so many ways their forests are, and what great economic benefits may be derived from their management on forestry principles they will refrain more than they do now from causing fires. For this reason I have taken pains to procure and to submit here fresh and reliable information on forestry in some of the countries of Europe which have long and successfully managed their forests on forestry principles. I am much indebted, for information, to the heads of the forest departments of France, Prussia and Switzerland.

Germany in the past hundred years has created the science of forestry. She outranks all other countries in forestry achievements. Yet France is not so very far behind in splendid forestry work. It has been my fortune to travel through France four different times; first in 1869, again in 1875, in 1876, and last in 1882, at which time I passed over the route from Paris via Bordeaux to Lisbon, and was par-





Photo by F. L. Hoxsle.

**VIEW OF THE SOUTH SHORE OF MILLE LACS LAKE;  
HARDWOOD FOREST.**

ticularly impressed by the extensive stretches of lofty, luxuriant and most beautiful forest. Not a dead, burned, nor even deformed tree was to be seen. I rode for hours through forests; first through hardwood, the clean, dense and thrifty appearance of which I especially admired, and afterwards, towards the Spanish border, through pine. All indicated the best of care.

## FRANCE.

The total extent of the forests of France (exclusive of the colonies) is about 23,500,000 acres, which represents about 17 per cent of the surface of the entire territory.

These forests are divided in: Forests of the state, 2,700,000 acres; forests of the municipalities and of the public institutions, 4,700,000 acres; forests of individuals, 16,100,000 acres. The forests of the state and those of the municipalities and of the public institutions are managed and supervised by the Administration of Forests. France only extends over 9 degrees in latitude, but, as it has very high chains of mountains, the result is that it possesses all the climates of Europe, from the hottest to the coldest, and that a great variety exists in the species of trees that compose the forests.

The principal varieties of these species are: In the warm region, comprising the borders of the Mediterranean sea and of the Gulf of Gascony, the Cork Oak (*Quercus Suber*); the Evergreen Oak (*Quercus Ilex*); the Cluster Pine (*Pinus Pinaster*) and the Aleppo Pine (*Pinus Halepensis*).

In the temperate region, comprising the plains, the rolling grounds and the lower parts of the mountains, the common European Oak (*Quercus Robur*); the European White Oak (*Quercus Pedunculata*); the Beech (*Fagus Sylvatica*); the Hornbeam (*Carpinus Betulus*); the common European Ash (*Fraxinus Excelsior*).

In the cold region, comprising the middle and upper parts of the mountains, up to the extreme limit of vegetation, the

Pectinal Fir (*Abies Pectinata*); the Norway Spruce Fir (*Abies Excelsa*); the Beech (*Fagus Sylvatica*); the Scotch Pine (*Pinus Sylvestris*); the Mountain Pine (*Pinus Montana*); the Larch (*Larix Europea*).

It should be noted that the beech is found at the same time in the temperate and in the cold regions. The Scotch pine, which belongs to the cold region, has been artificially introduced on large areas in the temperate region.

#### STATE FORESTS.

The total area of the forests of the state, 2,700,000 acres, is composed of 2,100,000 acres of productive forests and of 600,000 acres of protective forests, situated in the mountains or on the dunes of the ocean; of lands recently purchased by the state on the banks of torrents and whereon timber is now being planted.

The forests yield annually to the state:

Timber (cubic feet).....	33,800,000
Fire wood (cubic feet).....	62,300,000
Total .....	96,100,000

This represents nearly an annual production of 46 cubic feet of wood per acre of productive forest. The state forests produce in addition thereto oak bark, which is used in the tanning of leather; cork, rosin and several other small products; also hunting rights are leased.

The gross annual income in money is \$5,500,000, or \$2.62 per acre of producing forest. In some forests this average is largely exceeded and it attains as high as \$8 per acre.

The expenses are as follows, viz.:

Labor .....	\$1,240,000
Forest instruction.....	35,000
Sundry works.....	360,000
Reforestation of mountains .....	700,000
Taxes paid to departments and municipalities.....	360,000
Sundry expenses.....	60,000
Total .....	\$2,755,000

But of all these expenses, a large share is applied either in administering the forests of the municipalities or in executing works of real public utility in the "protection forests," or in reforesting mountain lands (to prevent slides and the like). If we make these several deductions we find that the expenses incurred in the producing forests do not exceed \$1,500,000, or 71 cents per acre. The net annual income of these forests is therefore \$2.62 less 71 cents, equal to \$1.91 per acre.

The state forests are carried on either as high forest or as coppice, and are managed under regulations made by the President of the Republic. Cuttings are made yearly. In forests rich in wood there is cut every year an amount equal to the increment or growth; in forests poor in wood they cut less than the increment in order to gradually increase the forest. The endeavor is made also to increase the production of the timber wood by reducing that of the fire wood. The "high tree forests" are cut down at periods ranging from 120 to 150 years.

The work is directed in a way that will insure natural reforesting from the seeds that fall from the standing trees. Not only the trees that have attained the age determined by the rules are cut down, but also the dead ones and those which are dying and those that prevent the growth of neighboring trees. In temperate climate the annual cutting of high trees is on a limited area; a large number of trees are cut down simultaneously. In very cold climates and where winds are to be feared, only a few trees are taken away at a time on the same point and cutting is then done on a larger area.

The low forest, coppice and second growth are cut in rotations, ranging from 25 to 35 years. The reserved trees, which are very numerous, are cut on an average every 100 years, but some selected trees are allowed to attain and even pass 200 years.

The labor performed in the forests consists in the construction and maintenance of forest roads, water sawmills, houses for watchmen, replanting. Fortunately, owing to the system of culture now in use, artificial reforestation has but little importance in forests, properly speaking, but sowing and planting in the small open spaces, or on the points where a few more valuable species are to be introduced, or where the soil of the forest is better adapted to some varieties, there, sowing and planting are more frequent. The average cost of such work is \$10 per acre.

Very considerable reforestation is made on mountain lands, where the state plants trees to regulate the action of the waters and stop the ravages of torrents. For that purpose \$700,000 are expended every year, the largest part of which is used in the purchase of land, and the other part in dams to regulate the streams, and in plantations to settle and retain the soil. The state purchases yearly on an average 16,000 acres. The average cost of reforestation is \$20 per acre, and \$18 must be added thereto for work in improving the streams, building roads, etc. Planting is preferred to sowing on calcareous or chalky soil.

The administration of the forests forms part of the Department of Agriculture. It has charge not only of the direction and care of the forests of the state and of those belonging to municipal corporations and public institutions, but also the overseeing of the fishing in the rivers and creeks. At its head is a director, residing in Paris, who has under him: A central service composed of 3 administering general inspectors, 10 inspectors, 5 assistant inspectors and 17 clerks.

An exterior service composed of:

First—Personnel superior or of administration—32 forest keepers, 200 inspectors, 215 assistant inspectors, 250 general wardens

Second—Personnel inferior or of surveillance—3,500 foremen and wardens, paid by the state; 3,700 foremen and

wardens, paid by the municipal corporations and public institutions.

The annual salaries paid are as follows:

#### SUPERIOR OFFICIALS.

Director .....	\$3,000
Administrators .....	\$1,800 to 2,600
Forest keepers.....	1,600 to 2,400
Inspectors .....	800 to 1,200
Assistant inspectors. ....	600 to 800
General wardens.....	300 to 520

exclusive of some additional allowances for traveling expenses.

#### INFERIOR OFFICIALS.

Foremen and wardens paid by the state an average of.....	\$160.00
Foremen and wardens paid by the municipal corporations and public institutions.....	116.00

The foremen and wardens receive in addition thereto allowances of firewood, tillable land, pasture grounds, etc.

Those in the employment of the state have free rent in houses built in the forest, or in lieu thereof they receive as compensation a cash equivalent.

The superior officials are entitled to a retreat pension at the age of 60 years, and the inferior officials at the age of 55 years.

France has three forestry schools. One school of higher instruction at Nancy; one school of secondary instruction and one school of primary instruction. The two latter schools are established in the department of Loiret, on the possessions of the administration at Barres.

#### FORESTS OF MUNICIPAL CORPORATIONS AND OF PUBLIC INSTITUTIONS.

The forests of municipal corporations and of public institutions comprise 4,700,000 acres. They are supervised by the Forest Service on the same conditions and according to the same principles as the state forests. They contain



about 200,000 acres of forests for protection, and their producing area is thereby reduced to 4,500,000 acres. They produce annually, timber, 42,000 000 cubic feet; fire wood, 128,000,000 cubic feet, and together, 170,000,000 cubic feet. This represents nearly an annual production in wood of 38 cubic feet per acre of productive forest. The annual cash value of the product including the bark, cork and rosin is \$6,400,000 or \$1.42 gross income per acre. The net income is about \$1.14 per acre. The forests belonging to the municipalities and public institutions are under regulations approved by the President of the Republic. These regulations and those of the state forests have been established with a view of insuring a continuous annual production and even of increasing that production in the forests where it is not yet sufficient.

#### PRIVATE FORESTS.

Private individuals are at liberty to manage their forests as they please. But they are prohibited from cutting and taking trees from forests which are necessary to maintain and regulate water flow, to protect lands against the encroachments of the sea and sands, to defend the territory, or which are necessary for the public health. The destruction of private forests has become rarer and rarer and the proprietors acknowledge now that on soils of poor quality the income from forests is greater than that from arable land. As a result the area of private forests, instead of decreasing, increases from year to year by reason of the timbering of lands on which agriculture pays but small profits.

The income from private forests in quantity and in money is not exactly known. It is, however, known that on the same area they pay less than the state forests. Private individuals in their anxiety to get returns are inclined to cut down the wood when it is too young, and in the forests where coppice wood is raised they do not leave a sufficient

reserve and oftentimes leave none at all. One can notice, however, that the principles of Sylviculture are spreading more and more in the culture of private forests. The large forests are subjected to the same mode of management and are treated like the state or municipal forests. On the whole the annual production is regular and tends to become better in both quantity and quality.

### FOREST FIRES.

In the temperate and in the cold regions of France, that is, in the larger portion of the territory, the fires are but few and cause slight damage. The long periods of drought are not frequent, the numerous roads that run through the forests make very good lines of defense, and the villages that surround the massive wooded areas furnish at the first alarm devoted laborers. The railroad companies, being held responsible for damage by fire caused by flying sparks from their locomotives, take particular care, and in exposed places cut the grass and brush along their roadbeds.

The forestry code forbids, under penalty of \$4 to \$20, carrying or lighting matches in or within a distance of 200 metres from the forests.

In the forest camps of the state, municipal corporations or public institutions, it is forbidden to the workers to light fire outside of the buildings or shops, the location whereof is indicated by the forest service.

In the warm region the dangers from fires are greater. As a preventative against them more roads are built, trenches 20 to 50 metres wide and kept free from grass and brush are made around the forest, along railroad lines, on the dividing lines between forests belonging to several owners, and also from distance to distance in the large and dense forests belonging to the same proprietor. The use of fire in forest camps and in agricultural camps situated within 200 meters from the forests, is forbidden during the months of June, July, August and September.

A special watch is organized, telegraphic lines penetrating the center of the forests admit of alarm of fire at its start and call for help. If the working force appears to be insufficient the military authority furnishes the deficiency and sends on the spot soldiers who act according to the directions of the forest service.

### COLONIES.

France, fully convinced that the preservation of forests is in all lands of the highest importance, has organized a forest service in its possessions outside of Europe: In Algeria, Tunis, Madagascar, Indo-China, Reunion. In Algeria the organization is exactly similar to that of France and calls for an annual expenditure for salaries and works of \$600,000.

The periodical on forests that has the largest circulation in France is the "Revue des Eaux et Forets," issued twice a month. It is edited by "J. Rothschild, 13 rue des St. Peres, Paris." The price of a yearly subscription for foreign states is \$4. The Administration of Forests does not publish an annual report, but limits itself to furnishing to the public authorities the information that may be called for.

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### PRUSSIA.

#### STATE FORESTS.

The extent of the state forests of Prussia is 6,955,227 acres. Included in this, however, are 715,637 acres not designed for tree culture. In addition, the extent of forests belonging to municipalities is 2,563,812 acres; belonging to churches, 207,752 acres; belonging to corporations, 555,900 acres; private forests, 10,828,730 acres, making an aggregate extent of 21,111,421 acres in the whole kingdom.

The prevailing kinds of trees in the state forests are Scotch pine, larch, beech, red pine, fir and oak. The value of the land varies so much, rising from a small amount to \$700 per acre, that it is impossible to give an average estimated value. The annual aggregate expense of administration (state forests) is as follows: The office expenses and maintenance, including expense for education in forestry, etc., averaged in the years 1893 to 1897, per annum \$8,500,000. The annual aggregate revenue in the years 1893 to 1897 amounted to \$17,200,000, being at the net rate of \$1.50 per acre of actual forest. The number of acres sown or planted with forest annually during the years 1893 to 1895 was 44,830.

The foresting of the beach is mostly effected from standing trees, though artificial sowing and planting are also done. The oak is either reforested by seed from standing trees or artificially through sowing or by planting. The Scotch pine is first cut clean and reforested by sowing or planting, and the red pine the same. Sowing from standing trees is not common. In regard to the continuity of forest products the forestry department endeavors to obtain the highest possible continuous net income. The usual method of cutting is in blocks clean.

Under the head of compulsory tree planting the following laws are referred to: The Forest Protection Law of July 6th, 1875; the law of August 4th, 1876, concerning the administration of forests owned by municipalities and public institutions in the provinces of Prussia, Brandenburg, Pomerania, Posen, Silesia and Saxony.

The average annual damage caused by forest fires in the years 1892 to 1896 was as follows: Totally or mostly destroyed, 2,992 acres; only slightly damaged, 117 acres; only the surface destroyed, 522 acres. The average annual number of forest fires in the years 1892 to 1896 was 36, the causes of which were as follows: 12 unknown, 2 railroads, 5 incendiary, 16 caused by carelessness, 1 lightning.

During the years 1892 to 1896 the annual average number of forest fires caused by railroad locomotives was 2.

The officers in the forest service are equal in rank to the other high grade officers in the government service. The foresters have clerical rank. The salary of "Oberforester" (district manager) ranges according to length of service from 2,700 to 5,700 marks. Unfavorably situated officers receive an additional amount, the maximum of which is 600 marks annually. In addition there is usually free residence and fuel. The salary of the "Oberforstmeister" (chief inspector) is from 4,200 to 7,200 marks, according to length of service, which is calculated from the time of qualification for the office of "Forstrath" (councillor). The "Oberforstmeister" and "Forstrath" are each allowed an amount not exceeding 2,900 marks for traveling expenses.

Among the best German forest periodicals are the Forestry and Hunting Magazine, by Dr. B. Dankelmann, Royal Prussian "Land Forstmeister" (forest councillor) and director of the forest academy at Eberswalde, and the Forestry Magazine, by "Oberforstmeister" Weise, director of the forestry academy at Muenden. "The forestry conditions of Prussia," by Julius Springer, Berlin, is also referred to.

#### PRIVATE FORESTS.

The extent of private forests in Prussia, as above stated, is 10,828,780 acres. About one-half of these forests are managed on forestry principles, and their average value is somewhat less per acre than that of the state forest. On the larger estates the area devoted to forests gradually increases, while on the smaller estates the forest area probably decreases.

Some of the forests of Prussia are attractive resorts for travelers, and especially pedestrians, who enjoy the excellent roads. Of the celebrated Thuringian chain, which is 70 miles in length by from 8 to 25 miles in breadth, a writer





**A FOREST ROAD AND A SPRUCE AND SILVER-FIR FOREST  
IN THE BLACK FOREST.**

**(Photos loaned by Mr. Austin Carey and Mr. John Gifford.)**

says: "The successive hills melt into each other in gentle undulations, forming a continuous and easily traced comb, and only the northwest slopes are precipitous, and seamed with winding gorges. This mountain range incloses many charming and romantic valleys and glens; the most prominent feature of its picturesque scenery is formed by the fine forests, chiefly of pines and firs, which clothe most of the hills."

Prussia comprises nearly two-thirds of the entire extent of the German Empire, yet its area lacks considerable of being twice that of Minnesota. Thirty-one per cent of its soil is predominantly sandy, and on the whole probably is not as good as that of Minnesota; yet it sustains a population twenty-five times as large as that of Minnesota. This fact might well find a lodgment in the minds of our statesmen, that whereas Prussia annually derives a net revenue of \$1.33 an acre from her 6,000,000 acres of state forest, our state, from about an equal area of land in its borders, adapted to forest, derives no regular net revenue at all.

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#### WHAT A MAINE TIMBER EXPERT SAW OF GERMAN FORESTRY.

Mr. Austin Cary, a timber expert of Bangor, Maine, who lately visited Germany to study its forestry, furnishes a very interesting and valuable paper on the subject in the report of the Forest Commissioner of Maine for 1896, from which I take the following extracts:

It is my purpose here to try to give some little idea of German forestry. Germany is an old country. Centuries ago what we might call its virgin timber was exhausted, and the country found itself with a dense population dependent on a limited area of land to supply its needs for wood material. What should they do? Should they stint their use in this direction to a niggardly amount? Should they exploit new territory and call on the stocks of newer countries for their supply? They did neither of these things. They went to work rather on their own soil to develop fully the resources and capabilities of their own land. The states and the nobles supported the work. Scientists



labored and managers experimented. Forest schools were established to spread through the land the knowledge of what had been gained. Finally they piled up a mass of exact information about trees and everything related to their life, and established a system of forest management based thereon, that is one of the finest monuments of the thoroughness, the conservatism and the patience of the German race. And to-day the forest stands as one of the prime objects of the people's regard, a source of health, wealth and national independence.

This report is concluded after several months' study on the ground of the forests of South Germany. As illustrations of what scientific forestry can do I wish to tell of a few representative facts that came under my own observation.

The first forest of which I gained any knowledge was the property of the city of Freudenstadt in Württemberg. I remember thinking as I rode up to the place by rail and found it a city of 6,000 inhabitants, that it wouldn't do for a man like myself, who wished to see nothing but woods from morning till night, to live in the city. I would get off into the woods themselves and live. How great was my mistake! The forest was all about us. In five minutes' walk from the center of the city one could step into such fine woods as cannot be found in the whole state of Maine. Spruce and fir trees two to three feet through and all the way up to 130 feet high stood on the ground as thickly as they could stand. There were acres there that would cut more than 100,000 M. The previous summer I had cruised all through the spruce lands of the Kennebec, and here on single square miles was more timber than on whole townships on that river. And the best of it was that this was no new or exceptional thing. The whole area of the forest was doing it. If it hadn't old timber it did have young, which is quite as essential to the result. They were growing that timber right along because they knew how to do it and because they were patient enough to wait for results.

The financial returns from this forest will be of interest. The yearly net revenue derived from its 5,950 acres had amounted in the last few years to from \$20,000 to \$25,000. The yearly yield of wood had been 106 cubic feet per acre. The revenue paid all the municipal expenses of a city of 6,000 people, relieving the citizens from local taxation and paying a bonus to each voter besides.

Baden Baden is another good illustration. The city owns 10,000 acres of forest land in its immediate vicinity, kept under the best of management, just about the equivalent of half a township of our Maine timberland and in much the same kind of trees. The yearly net revenue from this tract, as an average from 1881 to 1891, was nearly \$3.50 per acre. That is about the total valuation, timber, land and all, of a pretty

good Maine township. A yearly net income of \$35,000 has here, it can readily be understood, a significance in connection with municipal expenses.

These two instances are by no means exceptional. The Black Forest, in which both these tracts are included, is a region of high and rough land about a million acres in extent, partly in Baden and partly in Württemberg. It is well cut up with railroads and turnpikes; it has towns and villages scattered all through it, but much the greater portion of its area is covered with trees. It is divided in ownership between the states, cities and towns, and private individuals, of which the publicly owned forests are uniformly well managed. The State forests throughout this district yield a net yearly revenue of \$2.50 per acre. Tracts of unusual productiveness have yielded \$10. The best feature of the situation is the certainty and regularity of the supply. The management is splendid in its conservatism. Timber is never cut till it is ripe. Managers take a pride in never making a false show by over-cutting. The yearly growth on these forest areas is closely known. Mills and markets have adjusted themselves to their output, and business in consequence is regular and certain.

In speaking of these results of German forestry we must not mistake the conditions to which they are in part due. German forest land in the first place is superior to ours. The soil is deeper and better as a rule, because the country was never glaciated in any such way. Some of their tree species moreover are faster growers than our own, though they have nothing equal to the American white pine. Then wood material in German forests is worth much more than in our woods, because it is close to a dense population which needs it. German forest management, however, is in itself a noble achievement. Without it, favorable natural conditions would be of little avail. By its means, Germany devoting a third of its territory permanently to forest—that third which is of smallest value for agricultural and commercial use—has been able not only to supply all her own demands for most kinds of wood material, but to furnish large amounts to less provident neighbors.

With these facts in mind as to the results of German forest management, the way is perhaps prepared for a statement of how they have been attained. Here we must be extremely brief. I propose as that bit of German forestry which seems to have most help in it for us in studying how to make the most of the woods of Maine to give in outline the history of a stand of spruce and fir in the Black Forest as it works out under the guiding hand of an Oberförster of the Baden State.\*

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\* Scientific readers must not hold me to strict accuracy here.

First of all, how does it start? How do the young trees come there? Most readers probably will think they are planted, but such is not the case. The man who has a big bill for nurseries and planting in his accounts is marked as a poor manager, and another may be found to take his place. No. It is rather by understanding the conditions which seeds require to germinate and young trees to thrive in, and making use of this knowledge in clearing off the old crop, that the young stand is founded. Let us, however, omit this for the present, and taking the young stand when it first has possession of the ground, trace through its history.

A twenty-year-old stand of spruce and fir in the Black Forest looks like one of our thickets that we say is as thick as the hair on a dog's back. The little trees stand closely together, their foliage is high up, and the limbs on the lower trunk killed off. Many of them by force of competition die every year, and when big enough the dead ones are taken out for fuel. And this dense condition is desired and promoted. The unbroken cover of leaves keeps the soil moist in summer so that growth is more rapid than it would otherwise be; the dense crowding cleans the lower trunk of limbs so that the heart lumber of the mature tree will be nearly clear. The trees on an acre of German forest are of approximately the same age. Experience has shown that more lumber and better lumber in the long run can be grown in that way than if trees of all sizes are kept on the ground at the same time.

Such is the condition of things up to forty years of age. The young stand is practically allowed to take care of itself, and this it does to entirely good advantage.

At forty years of age, however, at which time the young trees might be four to eight inches in diameter and fifty feet high, a strong thinning is made. Poor and deformed trees are taken out, those that are diseased as well, and such also as are overcrowded and seem destined to an early death. By this means the stand is much improved. Every tree left standing is one that is straight and good, and it has a good chance to grow. The stand by this treatment may be left pretty open in places, but in the next few years it closes up again. The trees stand as thickly on the ground as they can stand. The dense foliage shields the soil from drying out, and prevents the encroachment of bothersome weeds. The density of a middle-aged stand in a German forest, the completeness with which it occupies the ground, is something hardly to be conceived till one sees it. Second growth pine groves are all we have in this country that approaches it. The shade of the foliage is so dense and complete that not a young tree or bush will be seen for rods. All that covers the soil is a fine, even coating of moss.

So the thing stands for forty years more. Only the trees that are crowded out are removed from the ground. These have a value to sell but none to grow. Most of them go into the manufacture of paper.

At eighty or one hundred years of age, however, another condition of things begins. Spruce and fir at this age will no longer stand densely together. They open of their own accord. Through blow-down or disease, also, little openings in the cover occur, and under these openings, where the sunlight gets down to the ground, a strange thing happens. Little seedlings, which up to this time may have been absolutely lacking, though the ground was showered with seed, begin to appear on the ground. Sometimes there is a perfect mat of them, and the forest manager, remembering that the time is not far distant now when his timber will be mature, when he will have to cut it and will want to replace it with another of the same kind, welcomes their appearance and cares for their welfare. As they grow larger and require more light and air, he opens up the old stand around them. With that, too, the patch of young trees spreads. More thinning out assists it; different regions of thinning run into one another. Finally the whole area of the stand has been lighted up, young trees have followed the favoring treatment and a dense crop of them covers nearly every square rod of the ground. Much of the old stand has in the meantime been reaped. What remains to be done is simply to clear off the balance with due regard for the welfare of the succeeding stand. By these measures and on these principles the land, in the course of 120 years, handled, of course, meanwhile by many individual managers, but always with regard for its productiveness in the long run, has produced a magnificent crop of timber, has yielded in the thinnings material much more than paying for the labor of its cutting, and it has afforded steady labor at about the rate of one man per 100 acres to four generations of men. During the last thirty or forty years of that time, simply by gradual removal of the crop and care for the young growth which succeeds correct handling of the conditions of light and soil, a new crop has been started ready to carry on the same process in its turn.

How much of the German practice may be adopted here to advantage, how much of it is possible under our business conditions, can only be told after trial. Whatever we do adopt will be gradually taken up. Many of the measures that are recommended from that source are the same that have been suggested to us already by the facts of our own woods.

Something we must take, however, from the general attitude of the German people to the forest. The facts of the situation, indeed, will compel us. The forest will have to be regarded as a field rather than

a mine. Having attained that, we shall have further to learn conservatism and patience. Patience is an essential in successful forest management. Trees grow but slowly to a mature condition. If they are cut before they are fit, the best results, the greatest aggregate returns, cannot be reaped.

On most sites the first principle of forest management, as it must come here, is that principle so often referred to as being already in the minds of our practical men—sparing the small trees. This policy is rendered all the more desirable by the fact that has often been pointed out in the course of this work, the vitality of spruce under shade, its ability to thicken up and grow after long and severe suppression. This policy, as often indicated in this work, will have to be applied with discrimination. The problem of windthrow will be a most troublesome one. The man who has to decide whether timber can be safely left, or whether if left it would merely be condemned to blow down, will have set him oftentimes a very difficult problem.

One great object of conservative forest management, however, will be the preservation of the small trees. With this in view many changes in our present lumbering methods will doubtless in time be made. In some directions the detail of the German practice may help us. Thus the Germans avoid cutting in the coldest weather when wood is brittle. On the other hand they like to cut when there is deep snow. That saves the little trees from destruction in felling.

A cardinal principle of the German practice, having value in this as well as in other connections, is never to clear off the whole or the bulk of a stand at any one time. This treatment greatly helps the young trees. Comparatively few are killed when but a portion of the overgrowth is taken, and injuries received they have opportunity to repair. Where a whole stand is cleared off at once little in the way of young growth will survive it.

How far we may be able to follow the example set us it is impossible without trial to say. Perhaps it will be possible in the not distant future to leave half the merchantable timber in a virgin stand for further growth. Such a course would insure a great volume growth on the land; it would allow each tree to be kept till it reaches its finest development; it would help to maintain the proportion of spruce seed supply needed to keep possession of the land. \* \* \*

In Germany the workmen in the forests are trained, almost skilled laborers. They work all their lives at their business; they are well paid as labor goes in that country; living with their families in the forest, they are put in no such social conditions as are the men in our woods. The German forest laborer is a steady, well-conditioned, contented man, who takes a pride in the forest in which he works.

## SWITZERLAND.

The Swiss Confederation is composed of twenty-two cantons, which are separate and sovereign states; and while each canton has legislative authority over forests, the Confederation also exercises legislative authority over them in certain regards. Under Article 24 of the Federal Constitution of May 29, 1874, the Confederation controls only the forests of the high regions, which are about 65 per cent of the total forest area of Switzerland. It is true that since the popular vote of July 11, 1897, which revises the said article 24, the Confederation has from now on the right of inspection of the forest police of the whole of Switzerland.

The federal law of March 24, 1876, which puts into execution the above-named article 24 of the constitution, was promulgated for the forests of the high regions. By the terms of that law the inspection by the Confederation extends over the entire territory of the cantons of Uri, Schwytz, Unterwald, Glaris, Appenzell, Grisons, Tessin and Valais and over the mountainous parts of the cantonal territories of Zurich, Berne, Luzerne, Zoug, Friburg, St. Gall, Jura and Vaud; but the law does not apply to the forests of the plains of the last-mentioned states, nor to the forests of the cantons of Soleure, Bale, Schaffhouse, Argovie, Thurgovie, Neufchatel and Geneva.

The Confederation is not actually the owner of any forests but a few of the separate states are owners. The forest domains are part of the national wealth, and comprise 91,587 acres. There are also in the cantons the forests of the municipalities and of the corporations, comprising 1,403,772 acres. Besides there are private forests, comprising 609,855 acres. The total area of forest is therefore 2,105,220 acres, or about 20 per cent of the total area of Switzerland.

Forests are found everywhere in Switzerland. The parts most heavily timbered are the mountain chains of Jura and

of the cantons of Schaffhouse, Soleure, Argovie and Neuchatel. Forests are found starting at 200 metres above sea level (in the canton of Tessin) and reach as high as 2,100 metres in the high mountain. In Argovie they even reach 2,300 metres in altitude.

The more common varieties of trees are, among the resinous kinds, the opicea, the fir, the larch, the Scotch and mountain pines, the Siberian pine; among the deciduous kinds, the birch and the chestnut tree; this last kind grows especially in the canton of Tessin.

The value of forest land varies greatly and depends on the location, the nature of the soil, thickness of the settlements, the increase of these settlements and on the trade in timber and other products of the forest. The value per hectare ( $2\frac{1}{2}$  acres) may range accordingly from 300 francs to 6,000 francs.

In regard to expenses of administration, a distinction must be made between the expenses incurred by the Confederation and those incurred by the cantons. In 1897 the expenses incurred by the Confederation for forest administration amounted to \$56,000.

The following are the net receipts from forests in 1896 as to a few cantons:

Zurich, 180,900 francs, or 91.06 francs per hectare of forest.

Berne, 893,000 francs, or 71 francs per hectare of forest.

Soleure, 33,400 francs, or 44 francs per hectare of forest.

St. Gall, 71,000 francs, or 84.60 francs per hectare of forest.

Argovie, 241,000 francs, or 78.73 francs per hectare of forest.

Vaud, 236,000 francs, or 32 francs per hectare of forest.

The net receipts from town and municipal corporation forests in 1896 were:

Canton of Grisons, 1,200,000 francs, or 10.40 francs per hectare of forest.

Canton of Argovie, 2,378,000 francs, or 70.60 francs per hectare of forest.







Photo by F. L. Hoyts.

**LOGGING RAILROAD BED IN HUBBARD COUNTY,  
NEAR WALKER.**

On an average about 412 acres of forest have been created annually during the past twenty years, at the expense of the federal treasury.

In order to regenerate the forests, both planting and natural seeding are practiced, as may be most effective. In the lowest countries where clean cutting is practiced, planting is resorted to. Where real dangers exist from avalanches, land slidings, etc., which do not permit complete denudation and where gardening is required, natural modes of regeneration are generally used, and sowing is seldom done.

Reforestation by the Confederation in high mountain regions costs on an average 400 francs per hectare for 6,000 to 7,000 plants set in their place.

The federal and cantonal legislations prescribe a sustained production for the forests of the state, of the towns and of the municipal corporations. If, through winds, snow-slidings or otherwise, too much timber has been destroyed, less cutting is done in the following years, in order that as rapidly as possible the forest may regain the number of trees fixed by the management. The forests are operated in various ways, according to localities and according to the size of timber that is to be grown, viz.: high forest, under-growth and coppice (*de hautes futaies, de taillis sous futaie ou de taillis simples*), which three modes of management are found in Switzerland.

In accordance with the terms of the federal law, the forest area cannot be reduced. The cleared land must consequently be reforested except in cases where an equal area of land is converted into forest. Furthermore, the cantons as well as the Confederation have the right to compel the creation of protective forests wherever they are needed for public utility.

Forest fires seldom occur. Of those which do occur the principal causes are carelessness in lighting fires in the immediate vicinity of the forests, and lack of care in the

woods. It is rare that a forest fire is occasioned by locomotives.

The administration charged to execute the federal forest law is the Federal Inspectorate of Forests, forming a part of the Swiss federal department of the interior. Nearly all the cantons have for their territories a forest administration. In the small states one single technical official is at the head of the service, but in the larger cantons the administration is under the direction of one or more chief forest inspectors or chiefs of the service and of several district foresters or forest inspectors. An inferior personnel instructed for the federal zone in courses lasting two months is attached to this technical personnel, and is organized to execute the work of forest economy.

A few cities or towns with extended and important forests have also a self forest administration, at the head of which is a person of technical forest training. Among them are Zurich, Berne, Lausanne, St. Gall, Winterthure, Friburg, Coire, Soleure, Schaffhouse.

The Chief Federal Inspector of Forests has an annual salary of 8,000 francs and fees of 8 francs per day and 8 francs per night, when he has to be absent, for his service; he gets his traveling expenses reimbursed; his first assistant has a salary of 6,400 francs and is similarly indemnified for his inspection trips.

The three inspectors of the canton of Berne receive each 5,300 francs per annum. They receive extra pay, 6 francs per day and 4 francs per night, for all inspections made outside of their city and their traveling expenses are reimbursed.

The high forester or chief inspector of the canton of St. Gall, who has a salary of 5,000 francs, receives 10 francs per day and 4 francs per night, besides his traveling expenses, when out inspecting.





Photo by F. L. Hoxsle.

**LOGGING DAM AND SLUICE ON RUM RIVER IN MILLE LACS COUNTY.**

The Federal Inspectorate of Forests publishes every year a report on its management. The majority of the cantonal inspectors do likewise.

The following are monthly forestry publications:

*Journal Suisse d' E'conomie forestiere*; *Der prattische Forsture*.

In the matter of taxes, the cantons are sovereign in their own limits. Taxation therefore differs according to the cantonal territory to which it applies. In all these states a tax on the fortune is imposed, and in most states that tax is combined with the tax on income. But for one and the same forest only one of these two modes of taxation is generally applied. A few examples will show: In the canton of St. Gall the state has paid to the towns in which it has forests a tax of 1.20 francs per hectare.

In Argovie the state pays to the towns where its forests are situated a tax of 2.40 to 3.20 francs per 1,000 francs of forest value. On the other hand, the towns only pay to the state a tax of 40 centimes per 1,000 francs of forest value. The private forest proprietor pays to the state 40 centimes and from 2.40 francs to 3.20 francs to the towns per 1,000 francs of forest value; and in addition thereto he is taxed on the income in the amount of 1 per cent of the average gross 2 per cent assessed forest value, but neither the state nor the towns pay a tax on the income of their forests.

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#### A SWEDISH FOREST MANAGED AS AN INVIOABLE INCOME YIELDING CAPITAL.

The forest of the Boxholm Company, situated in the province of Ostergotland, in the south central part of Sweden, on the principal railway from Copenhagen to Stockholm, and about sixty English miles southwest of the port of Norrkoping, is managed on forestry principles; that is, it is managed with a view to a sustained yield, and for that reason a short account of its present situation will be of value. Including pastures the forest comprises 55,000

acres, the surface is rather hilly, and 20 to 30 per cent of it is rocky; soil sandy and gravelly and for the most part unsuitable for agriculture. In the forest proper three fourths of the trees are pine and one-fourth spruce; in the pastures birch, pine and spruce together or mixed. On an average about 250 to 500 acres are cut over annually; and old forest generally yields 100 to 150 cubic meters per tunnland (one tunnland equals one and twenty-two hundredths of an acre), of which 70 per cent is merchantable timber. Hitherto the forest has been cut in stands having an age of 100 to 150 years or older, together with thinning in younger stands; on the high land the forest is usually cut at the age of 50 to 70 years, although clean cutting seldom occurs. The annual product is about 50,000 logs of full tree length, 6 inches and upwards in diameter at the top; 20,000 cubic meters of charcoal and all timber required for building, repairs, fencing, etc.

Of the cut-over area on high land perhaps one-third part becomes reforested naturally by self seeding. Cutting in strips is not practiced, but it is considered preferable to make small clearings, and first in that part of the forest which is more distant from the prevailing winds. To effect reforestation by sowing seed, the ground is first cleared of leaves, twigs and moss by burning, which usually is done in the spring or summer. The following year, or, if the burning takes place in the spring, then the same year if one chooses, the ground is then prepared in pieces a foot square, at proper intervals, and the seed sown in them. The first year the young plants are protected from pasture animals by fencing. About 2,500 seeds are sown per "tunnland." On grassy places planting occurs instead of sowing. Planting at the Boxholm forest is done partly with transplants (plants which had previously been taken from the nursery and set in other ground), which are set in holes either with the roots only or with the adhering clumps of earth; partly with seedlings (plants direct from the nursery or first bed), which are set in filled holes with a plant-

ing pin. Pine transplants are generally three and spruce four to five years old. When seedlings are used they are, if pine, generally one year old and spruce seedlings two to three years old. The number planted on a "tunnland" varies from 1,500 to 2,500.

The number of timber trees cut on a "tunnland" averages about 100. During even very dry seasons not much is done to prevent forest fires. The forest watchmen perhaps exercise more attention and employ more care; and generally the precautions against forest fires prevent their gaining any great extent. In case any part of the forest is burned, it is, after a year's time, resown to forest.

The cutting of timber in this forest has been in progress by the present company twenty-five years; and in previous years it had been operated for timber and charcoal.

There are scores if not hundreds of such forest properties in Sweden.

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## DUCHY OF BADEN.\*

### STATE FORESTS.

The aggregate extent of the state forests of Baden is 240,304 acres, located in the Black Forest and the upper valley of the Rhine. The prevailing kind of trees is coniferous. The beech, however, covers the largest surface; next follows the fir, then the silver fir and the Scotch fir. The average estimated value per acre, taking the average of the ten years 1886-1895, is \$98.55. The annual aggregate expense of administration is \$568,078. The annual aggregate revenue amounts to \$1,235,332, and the net revenue is \$667,244. Number of acres annually sown to forest is 222, and the number of acres planted is 823. Reforesting is effected by seed from standing trees; also by planting trees, in some rare cases by artificial sowing, the latter in the case of firs. There is a gradual increase of crop. The usual method of cutting the crop consists in

\*This and the two following sketches of forestry in Bavaria and Wurtemberg were printed in my report for 1896.



cutting the mature trees and covers at periods, as a rule, from thirty to forty years, with longer or shorter intervals. Cutting in blocks clean (pines and Scotch firs) in exposed stormy situations is less frequent. According to paragraph 29 of the Forest Law of Baden of the year 1879, no part of any forest is allowed to be kept uncultivated. The number of forest fires during the years 1879-1888 was 61, the damaged surface 99 acres, and the damages amounted to \$2,225. The principal causes of such fires are negligence, when burning down the skirts of the forest, or by throwing away matches or stubs of cigars. Very few cases of fires are caused by railroad locomotives.

The forest service ranks equally with other branches of the public service, and is comprised in Class D of the tariff of salaries. Seven members of the Administration of Domains (which forms a part of the Treasury Department) are the highest forest officers; they bear the title of Councillors of the Forest Board, and have a salary not exceeding \$1,380 and \$147 compensation for rent.

Besides the state forest there are community and corporation forests, covering a total surface of 555,069 acres, which are managed on the same principles as the state forests.

#### PRIVATE FORESTS.

The aggregate extent of the private forests is 451,670 acres. About one-third of all private forests is managed on forestry principles, including the forests of the Public Administration of Street, River and Railway Construction, and the most extensive and important private proprietors. The total forest product of the country increases gradually.

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### BAVARIA.

#### STATE FORESTS.

Bavaria, whose attractive capital, Munich, is frequented by so many Americans, has 6,000,000 inhabitants. Its for-





Photo by F. L. Hossie.

**CUT OVER PINE LAND IN MILLE LACS COUNTY, BURNED  
PREVIOUS TO 1895.**

ests comprise 2,150,000 acres, of which 34.08 per cent are the property of the state. Large forests are to be found in all parts of the kingdom; but as a general rule the mountainous districts in the south (Alps), the north (Spessart) and northeast (Bohemian Forest) are covered with the densest forest. Of the whole area of the country 33 per cent is covered with forest. The prevailing kind of trees, or 77 per cent, are coniferous. The remainder comprise various kinds of deciduous trees—those losing their foliage in winter. Among the conifers red and white pine are most frequent. Among the deciduous trees the beech occupies the greatest space. The oak is also cultivated quite extensively for tanning purposes. The average estimated value of the forest land is \$50 per acre. The annual aggregate expense of administering the forests (1891) including salaries of officials, wages of workingmen, local taxation, new purchases, etc., amounts to \$4,965,204. The total revenue from the forests the same year amounted to \$8,187,349. Number of acres sown or planted to forests in 1892 was 14,800, more than three-fourths of which area was planted with coniferous trees. In the case of the red pine and the white pine, reforestation is mainly done in the natural way. In the case of the fir (*Pinus sylvestris*) it is always effected artificially; in the case of the beech, always in a natural way (seed from standing trees); in the case of the oak, generally by artificial sowing. There is a continuity of forest products and a steady increase of the revenue which the state derives from its forests. This is due, first to an increase of prices, secondly to an increase of the yearly crop. The latter must chiefly be regarded as a result of the present condition of the forests which are being and have been steadily improved; also of the economy which was practiced in former times. Where reforestation is effected by seeding from the standing trees, the crop is generally cut in lengthy strips, usually not exceeding about thirty yards in width. As a general rule the administration of the state forest makes it a principle to avoid cutting in large blocks clean. In regard

to compulsory tree planting, it may be said that every forest area, the trees of which have been cut, no matter whether state or private property, must be reforested in a short time, unless evidence can be furnished that the land would be better adapted to agricultural purposes.

The damage caused by forest fires is quite insignificant, being in 1890 only \$974, in 1894 only \$1,686. The principal cause of such fires is the carelessness of the workmen employed in the forests and of individuals and parties making excursions, particularly on Sundays. There are no data at hand as to the number of such fires caused by railroad locomotives, and although some fires are no doubt so caused, the number is certainly very small.

The administration of the Bavarian state forests constitutes one of the departments of the ministry of finance. It is directly subordinate and responsible to the latter, no other authorities intervening. The highest forest official who may be regarded as being at the head of the forest administration, responsible, of course, as stated, to the minister of finance, bears the title "Ministerialrath,"—ministerial or cabinet councillor. The chief director of the Bavarian administration of state forests is "Ministerialrath" Ganghofer. His starting salary is 7,740 marks. After a sixteen years' service the salary advances to 8,820 marks. Next in rank are the so-called "Oberforstrathe," with a starting salary of 6,660 marks, which after a sixteen years' service, is increased to 7,740 marks.

There is no regular report published on the administration of the forests; however, the reports of the Royal Bavarian Bureau of Statistics, which are published four times a year and the "Statistische Jahrbuch für das Königreich Bayern," which is issued annually since 1894, contains some data referring to Bavarian forestry. In addition budget reports on the administration of the state forests are submitted to the "Landtag" or Diet every second year.

## PRIVATE FORESTS.

The aggregate extent of private forests was 3,149,400 acres in 1893. In addition to the state and private forests there are about 800,000 acres of forests belonging to separate towns and villages. The forests which are owned by great landholders are managed on forestry principles. These forests, however, only comprise a very limited area, somewhat less than 400,000 acres. Most of the private forests are the property of small landholders. The average value per acre of private forests is somewhat less than that of the state forests. The net income rate varies widely. The data at hand are too few and too unreliable to admit of arriving at any conclusion with regard to the average. Opinions vary as to whether the total forest product of the country increases or decreases. In general the extent of the private forests seems to be somewhat decreasing. This would of course also appear to entail a decrease of the total forest product. Forest lands are only allowed to be changed into agricultural lands when proof can be furnished that the agricultural crop may be expected to exceed in value the forest crop. Between 1886 and 1891 from 7,000 to 8,000 acres of private forests were newly planted or sown.

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WURTEMBERG.

Wurtemberg lies west of Bavaria, and is the third German state in point of area, its population being a little over 2,000,000. Its greatest length from north to south is 140 miles, and its greatest breadth is 100 miles. One-third of the Black Forest (so called from the dark foliage of its pines, and which forms a sort of a triangle,) lies within Wurtemberg, two-thirds being in Baden. The Black Forest has a total length of 93 miles, and its breadth varies from 13 to 46 miles.

## STATE FORESTS.

The aggregate extent of the state forests is 418,904 acres, and they extend over the entire kingdom: 59 per cent of the forests consists of pine, 20 per cent being pitch pine and 9

per cent white pine. The estimated value of the forest land varies from \$29 to \$58 per acre. The annual aggregate expense of administration of the forest amounts to \$1,183,574. Of this \$364,140 is paid to wood-cutters, \$147,560 is expended on roads, \$90,440 in forest culture, \$259,468 for pay of officials, \$138,468 for forest guards. The revenue for 1895-1896 was \$2,928,352, yielding a net revenue, after deducting all expenditures, of \$1,744,778, or \$3 63 per acre. The number of acres annually sown to forest is 296, and the number of acres planted to forest, 6,177.

In regard to reforestation, when the natural seeding of the desired kind of wood occurs in proper time the same is used; otherwise planting or artificial sowing takes place. Natural sowing is estimated at about 25 per cent, artificial renewing amounts to about 75 per cent. The latter is almost exclusively done by planting, whereas sowing in free woodland is very seldom applied. It is a principle to maintain (as far as the division of the age of the plantings permit) an equal annual cutting. At present the cutting is fixed at 1.94 cubic metres per acre. The cutting is contracted for with laborers living in the neighborhood of the woods. By good management there are at a given plot generally trees of about the same age. If the natural seed falling is intended to be used, the larger trees, either single or in crops, are cut out in a direction against the prevailing winds; the remaining trees are thinned and gradually cut out as the growing young trees may demand. If the natural seed falling is not taken into consideration, the wood crop is cut clean in narrow strips, also in a direction against the prevailing winds, and the cutting of the second and following strips is postponed until the young plantings can dispense with the side protection of the old woods. It is a principle that replanting follows immediately after the cuttings. Moreover the state buys every year about 400 acres of woodland to increase and round off the forests.

The amount of damage annually caused by forest fires only \$642.60, and the principal cause of such fires is carelessness and negligence while smoking and lighting fires







Photo by F. L. Hoxsie.

**SECTION OF WHITE PINE, 30 INCHES IN DIAM-  
ETER, NEAR WALKER, CASS COUNTY.**

in or near the forests. In the last ten years out of 120 forest fires only 8 were caused by sparks from locomotives and of these only one caused considerable damage (about \$3,570).

In regard to the rank in the forest service, as compared with other branches of the public service, it may be said that the forest officials rank in general equally with those state officials who are graduates of the university. The Department of Forests is directed by one president, four technical and four administrative members and one commander of the forest guards. The salary of the president is \$1,844.50 per year; the salary of the members of the Board of Direction is from \$1,190 to \$1,618. A work entitled "The Forests of Wurtemberg," published by Rueger, Stuttgart, 1880, gives a fair review of the situation of the forestry of the country. It may here be stated that in respect to net revenue Saxony and Wurtemberg stand at the head of forest administration and forest culture in general.

#### PRIVATE FORESTS.

The aggregate extent of private forests is 528,794 acres, of which 210,000 acres are administered by technical forest officials; the remainder is also administered in a proper manner. As the permission of the government is required for cutting and replanting of forest lands, and this permission is only given under the condition that an equal area to what has been cut shall be planted, the aggregate area of forest land remains the same throughout the whole country; but portions of it are gradually coming into the possession of the state government.

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#### PROGRESS OF FORESTRY IN OTHER STATES.

The first important forestry meeting in this country was the Forestry Congress at Cincinnati, in 1882, an organization since changed to the American Forestry Association. Fifteen years ago a division of forestry was established in the Department of Agriculture, Washington City, for scientific experiment and investigation in forestry. The President through a commission of able scientific men, has

lately set apart extensive forest reservations in several of the Western territories and states, and it is to be hoped that the policy will be upheld by congress.

#### NEW YORK.

Among the separate states, the Empire State of New York first began important work. Actuated by a desire to prevent forest fires, the State of New York, in 1884, appointed a very able commission to investigate and report a system of forest preservation for the Adirondack region. The next year the legislature enacted a law, recommended by the commission, for a fire warden system (in principle like the fire warden law enacted in this state in 1895, making town supervisors fire wardens) for a forest commissioner, for a superintendent of forests and for several expert foresters.

A very important recent step in the cause of forestry by the State of New York, was its law of March 26, 1898, establishing the New York State College of Forestry in Cornell University at Ithaca, N. Y. The university is authorized to purchase (and the state will pay for) 30,000 acres of land in the Adirondack forests for the use of the college. In addition, the state has appropriated \$10,000 to put the college in operation; and Dr. B. E. Fernow, LL. D., for many years chief of the United States Division of Forestry, has accepted the position of director of the college. The following clause in section two of the Act indicates the use that is to be made of the 30,000 acres:

The university shall have the title, possession, management and control of such land, and by its board of trustees, through the aforesaid college of forestry, shall conduct upon said land such experiments in forestry as it may deem most advantageous to the interests of the state and the advancement of the science of forestry, and may plant, raise, cut and sell timber at such times, of such species and quantities and in such manner as it may deem best, with a view to obtaining and imparting knowledge concerning the scientific management and use of forests, their regulation and administration, the production, harvesting and reproduction of wood crops and earning a revenue therefrom, and to that end may constitute and appoint a faculty of such school, consisting of one director or professor and two instructors, and may employ such forest manager, rangers and superintendents, and incur such other

expenses in connection therewith as may be necessary for the proper management and conduct of said college and the care of said lands and for the purposes of this act, within the amount hereinafter appropriated.

In a very few years the States of Maine and New Hampshire followed the example of New York and created forest commissions, which have done much to diffuse knowledge of forestry, and which have, to some extent, induced lumbermen to manage their timber lands with a view to a sustained yield. The New Hampshire law enables the state to accept and hold donations of land for forest purposes, or of money to buy such land; and some such donations to the state have already been made. One of the New Hampshire forest commissioners goes round with the Farmers' Institute and delivers addresses on forestry. The State of Massachusetts enacted a law last year for the prevention of forest fires. New Jersey is having an official investigation made of the amount of timber growing in the state. Wisconsin, which enacted a fire warden law in 1895, created last year a forest commission to investigate and report a plan for forest preservation.

#### PENNSYLVANIA.

But it was left for the State of Pennsylvania, the past year, to make a most important forward movement in forestry. She advanced all along the line on the double-quick. A discussion and agitation of the subject of forestry and in which the ladies took an important part, had been going on for some years in Pennsylvania; the governor of the state, as is the case with the governor of New York, is a strong friend of forestry, and the result was that the legislature of Pennsylvania last year enacted four important forestry measures. One of these measures provided for a division of forestry, with a commissioner and clerk in the Department of Agriculture. Constables of towns are made fire wardens. Another act provides that any owner of not exceeding fifty acres of land, having on it forest or timber trees of not less than fifty trees to the acre, of certain dimen-

sions, shall be entitled to receive annually during the period that the trees are maintained in sound condition, a sum equal to 80 per cent of all taxes annually assessed and paid upon the land. Another act authorizes the forest commissioner to bid in for the state any lands offered for sale for taxes which he thinks is desirable for forest reservations. But the most significant and important act of all was one for creating large reservations to aid in maintaining water supply at the sources of the three great river systems in the state. The law provides for taking, by the state, under the right of eminent domain and paying for the same, after due valuation, three forest reservations, as follows: One of not less than 40,000 acres upon waters which drain mainly into the Delaware river; one of not less than 40,000 acres, upon waters which drain mainly into the Susquehanna river, and one of not less than 40,000 acres upon waters which drain mainly into the Ohio river.

#### NORTH CAROLINA.

North Carolina is distinguished for the splendid forestry work being done by Mr. George W. Vanderbilt on his princely estate at Biltmore, where he is having 8,000 acres of forest managed on strictly scientific principles, under the charge of Lieut. C. A. Schenck, Ph. D., of Darmstadt, Germany, a man of the highest practical and scientific attainments. The total area on the Biltmore estate under forests is 88,000 acres, of which 80,000 acres are lying in the higher mountains of the Alleghenies and known by the name of Pisgah Forest. Biltmore forest proper, in the valley of the French Broad river, "is stocked mainly with oaks and short leaf pine of such a quality (the forest having been lumbered over in previous years) that the output of lumber will be for a considerable length of time none or practically none. It is therefore possible only to make so-called improvement cuttings in which any misshaped trees of large and small size are removed and cut into cordwood, while all healthy specimens of trees growing vigorously and



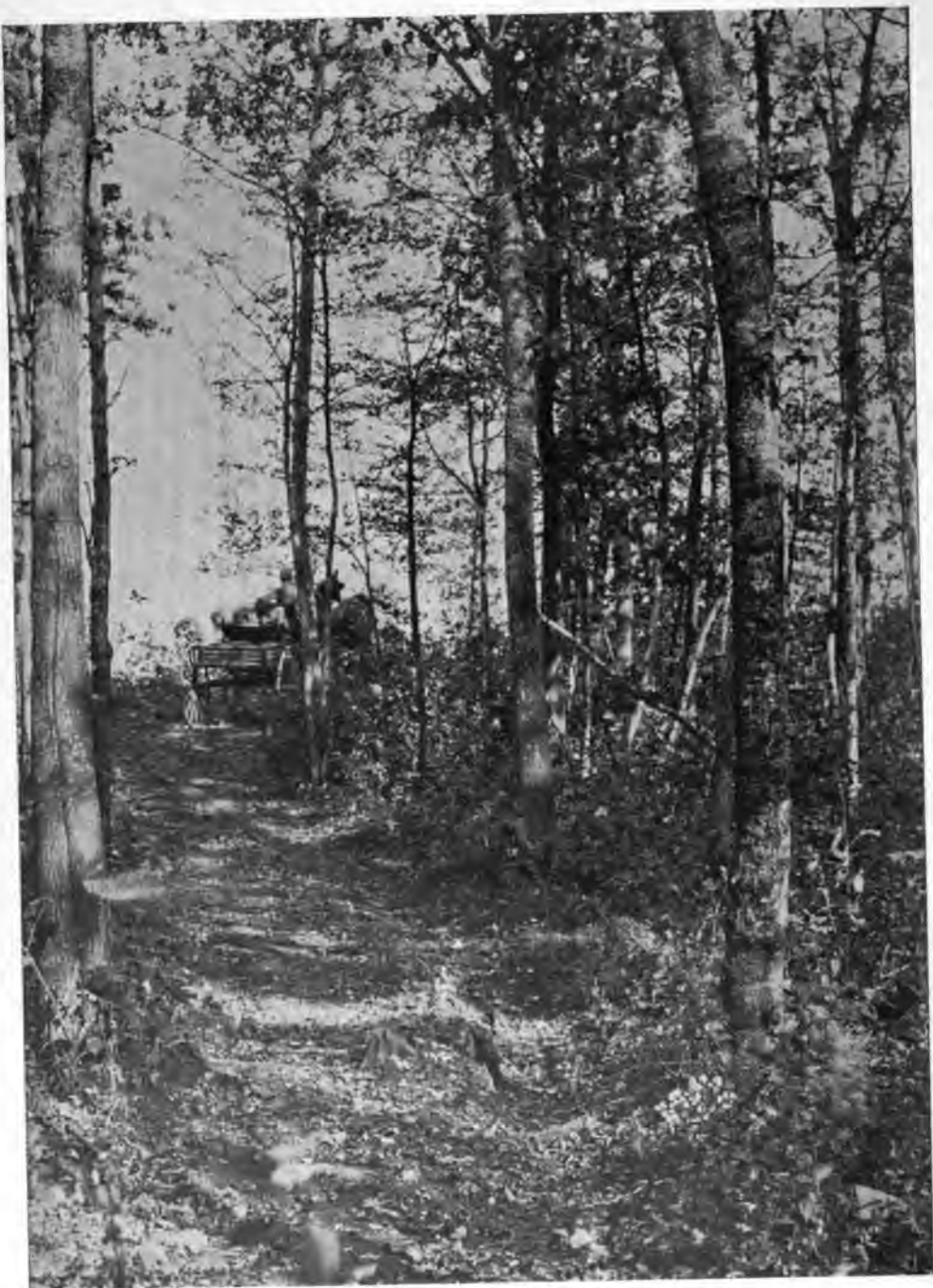


Photo by F. L. Hoxsie.

MIXED—MOSTLY HARDWOOD—FOREST ON SOUTH SHORE OF MILLE LACS LAKE.

promising to develop into timber trees are left standing." During 1897 the wood sales more than covered the running expenses of the forest. A comprehensive system of roads has been developed during the last eight years, which are being extended. Fifty acres of bare land are annually planted to forest.

The Province of Ontario, which has established a grand national park of over a million acres within one hundred and fifty miles of Toronto, has a Bureau of Forestry and a system for preventing and extinguishing forest fires. The annual reports of its Bureau of Forestry are able documents. A Royal Commission of five members appointed in June last for the purpose of investigating and reporting on the subject of "restoring and preserving the growth of white pine upon lands in the province which are not adapted for agricultural purposes or for settlement" personally visited considerable territory in the summer and fall and submitted a valuable preliminary report the 10th of December. New Brunswick enacted a law for the prevention of forest fires in 1885.

#### CONCLUDING REMARKS.

The State of Minnesota has for twenty-five years annually paid and still continues to pay \$20,000 a year in bounties for planting trees on the prairies, "the beneficial result of which," to quote the governor's Arbor Day proclamation, "is seen in the many artificial bodies of timber in the prairie region and which have greatly improved and beautified that portion of the state." The Minnesota State Forestry Association, organized in 1876, was one of the first associations of the kind, if not the first, organized in the country. In 1895 the present forest fire warden law was enacted. Last year the regents of the State University established a School of Forestry in the College of Agriculture under the charge of Professor Samuel B. Green. The study of forestry is included under two courses: "Course 1. Lectures: The forestry situation in this country and its litera-



ture; lumbering in Minnesota; forest influences; forest supplies; forest management; prairie forestry. Course 2. Lectures and field work: Characteristics of forest and ornamental trees that are hardy in Minnesota; their value for timber and other purposes and methods of propagation."

An important recognition of the forestry movement and of the fire warden service in this state was made on the occasion of the seventh annual convention of the Mississippi Valley Lumbermen's Association at Minneapolis, March 1st, 1898. Mr. W. H. Laird of Winona, Minn., president of the association, in his annual address before the convention, used the following words:

This also suggests whether the time has not arrived when we should take some action towards conserving our forests. This subject has forced itself upon thinking men in other localities, and other parts of the country, notably Pennsylvania, where the subject of reforestation, through state aid, is receiving the support and countenance of practical lumbermen. We, who are so vitally interested in the timber supply of this country, ought to be foremost in forwarding any practical measure which may continue the industry in which we are engaged. That this can be done is being abundantly illustrated in other lands. May we not take timely action before it is too late, and encourage now the reforestation of some of the lands already denuded of their growth? In our own state we are not without evidence of the value of the effort made to prevent the destruction of our forests by fire. This should receive more general support.

Forestry is twenty times more important to Minnesota than it is to Pennsylvania. Forest wealth is one of Minnesota's specialties. Yet during 50 years we have seen the capital stock of our splendid forests undergoing exhaustion without lifting a finger (except passing the recent law for preventing forest fires) to promote continuous forest yield. We have been in winter quarters on this forestry question too long. We need to make an advance all along the line both for economy and for honor. States have reputations as well as individuals, and they are well known and appreciated in the great business and money centers

of the East. If one goes there for a loan or for a business situation his chances will be all the better if he hails from a state that stands high for enlightenment.

Some people seem to argue as if there was an inherent weakness in our republican form of government that disqualified it from taking care of its forests. France and Switzerland are republican, yet they have no trouble in managing their forests so as to derive from them a continuous net income. Within its proper sphere a republic is as strong as any government. If a republic can carry a letter for a private citizen from Maine to California for two cents, it can take care of its forests. Let anybody meddle with the United States mails and they will see whether or not a republic has power! So, there are opponents of forestry who talk as if science was something this country has no need of. Forestry science, they say, will do for Germany but not for America. But if such people had equipped our Navy, Commodore Dewey could not have gained his splendid victory. It was because his ships were up to date in science that he could accomplish such a brilliant result. In those departments of our government in which we are up to date in science we are the equal of any other country; and if we will apply science to forestry we will, not soon, but in due time, have as good a forestry system as any other country.

Meantime let everyone learn by heart this fact, that Saxony,—a state which leads all other countries in forestry and in whose capital, Dresden, many young Americans have acquired a part of their education,—that Saxony, from its 430,000 acres of forests, mostly poor mountain land, derives an annual net income of \$4.50 per acre; the forest at the same time being sustained and steadily increasing in value.

Respectfully submitted,

C. C. ANDREWS,

*Chief Fire Warden.*

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# FOREST PRESERVATION

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## FOURTH ANNUAL REPORT

OF THE

## CHIEF FIRE WARDEN

OF

## MINNESOTA

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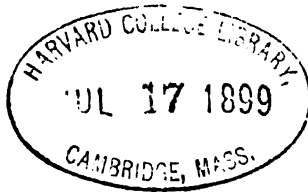
UNDER THE ACT OF THE LEGISLATURE ENTITLED  
 "AN ACT TO PROVIDE FOR THE PRESERVATION OF FORESTS OF THIS STATE  
 AND FOR THE PREVENTION AND SUPPRESSION OF FOREST AND  
 PRAIRIE FIRES," APPROVED APRIL 18, 1896.

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FOR THE YEAR 1898.

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ST. PAUL, MINN.:  
 PRINTED BY THE PIONEER PRESS COMPANY.  
 1899.



*The Chief Fire Warden*

STATE OF MINNESOTA,  
OFFICE OF CHIEF FIRE WARDEN, }  
ST. PAUL, April 20, 1899.

*Hon. R. C. Dunn, State Auditor and Forest Commissioner:*

SIR: As required by section 3 of the Act for the Preservation of Forests, etc., approved April 18, 1895, I have the honor to submit, herewith, my annual report for the year 1898.

Very respectfully,

C. C. ANDREWS,

*Chief Fire Warden.*

FOURTH ANNUAL REPORT  
OF THE  
CHIEF FIRE WARDEN  
OF MINNESOTA

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The most notable thing in respect to forest fires in Minnesota in 1898 was the fact that although there were a few weeks of dry and dangerous weather in the northern part of the state, both in the spring and autumn, our state escaped any very serious fires, while in the adjoining state of Wisconsin forest fires occurred in the fall, of magnitude to be heralded as a calamity. The forest fires in Wisconsin, the million-dollar forest fire in Michigan in 1896, and the extensive fires in South Dakota, will impress a candid person of the value of even the little preventive means used in this state.

The discussion of the Minnesota fire warden system that took place in the legislature that has just adjourned attracted general attention and no doubt resulted in good. It was urged by some that it would be preferable to have county commissioners appoint fire wardens for their respective counties, and that a supervising state officer at the capital to enforce the law is unnecessary. Certainly if county commissioners would appoint fire wardens who



would attend to their duties, it would be much better than having no such officers. But such fire wardens would need to be paid, and if the state is to bear a part of the expense, as is now the case, there would need to be a state officer to see that the money was properly expended. To whom would such fire wardens make their reports of fires, and from whom receive instructions, if there were no supervising county or state officer? Who would determine when help should be furnished from adjoining districts? It is probable that such a system would be more expensive and less efficient than the present one.

The argument that there is no need of a chief or supervising officer to administer the fire warden law is particularly unsound. Everyone will admit that military companies and regiments are organized in a way that will best promote efficiency. The men are generally of a character to perform their duties with alacrity and self-sacrifice; and yet each company of less than a hundred men, and when in the field averaging probably less than sixty men, is provided with a captain and two lieutenants to maintain efficiency and see that they do their duty. And that a regiment shall be efficient it is provided with a colonel and two or three other field officers. How, then, can anyone say it is a needless expense to have an officer to overlook and direct several hundred local fire wardens? The duty of the principal officer in the fire warden system is to keep the local fire wardens instructed and on the alert in respect to their duties, so that they will warn careless people against causing fires, and in dangerous weather act with promptitude in extinguishing fires, and promptly report in regard to them. In short, the duties and authority of the Chief Fire Warden are to

Enforce the fire warden law;

Divide into fire districts unorganized territory;

Appoint fire wardens in or near unorganized territory;

- Have general charge of fire warden force in the state ;
- To mass the fire warden force at any point ;
- Appoint temporarily fire wardens ;
- Coöperate with police or military force of the United States ;
- Furnish warning notices to fire wardens and railroad companies ;
- Instruct fire wardens as to their duties ;
- Require reports from fire wardens ;
- Investigate, and include in ANNUAL REPORT, information as to
  - Extent of the forests in the state ;
  - Amounts and varieties of wood and timber growing therein ;
  - Damages done by forest fires, and causes of such fires ;
  - Method used to promote regrowth of timber ;
  - And any other important facts relating to forest interests.

Our Minnesota fire warden law is substantially the same as has been in successful operation in the forest regions of New York for fourteen years ; and the same as has been in operation in Maine and New Hampshire for nearly ten years. It is not a perfect law, but can anyone suggest a better system at a moderate expense ? The three town supervisors in each organized town ought to be, and generally are, respectable citizens. They live at different points in their townships, and in attending to their official duties are traveling frequently through their towns. Who better than they could warn any carelessly inclined person in a dry season to be careful about fires ? Who better than they would be likely to know of any heedless settler who

might be about burning his brush in a dangerous season? And who better than they would be most likely to have the ability to summon prompt help in case of a fire? No doubt a better system than the present could be devised, but it would necessarily be much more expensive.

#### A FOOLISH ARGUMENT.

People sometimes say in argument against the fire warden system, that it would have been impossible to extinguish the Hinckley forest fire. No sensible man pretends that human agency can extinguish a great forest fire. The great object of the fire warden law is to prevent such fires from starting, or if, unfortunately, they have started, to extinguish them before they become unmanageable. The Hinckley fire started eight miles distant from Hinckley, and was gradually burning about a week before the fatal day. Such has been the history of about all the very disastrous forest fires. Under the fire warden law there is a local officer who can seasonably summon a plenty of help to extinguish a fire before it becomes too dangerous. Prevention is the main feature of the fire warden law, as is seen in the importance attached to posting and publishing warning notices, provided in section 4.

#### EXPENSE OF THE SYSTEM.

The extreme frugality of our forest preservation and fire warden system will be noticed when compared with the ordinary fire systems in our various cities and villages. There are two hundred cities, towns and villages in Minnesota having fire systems. The annual expense of the fire system of St. Paul is \$185,000, of Minneapolis \$365,000, of Duluth \$75,000; total for the three cities, \$625,000, which, added to the expenses of other cities, towns and villages for their fire systems, will foot up to over a million dollars as the annual cost of extinguishing fires. Com-



White pine cut on Great Northern Railroad right of way (Fosston extension), near Wrenshall. View taken June, 1888, before road was completed, for the Annual Report of the Chief Fire Warden of Minnesota.



pared with this how insignificant is the amount, as shown by the State Auditor's reports, annually expended for preventing and extinguishing forest and prairie fires, it being less thus far than \$5,000 expended by the state, including one-third of county expenses, which the state pays, and less than \$100 on an average for each of the thirty odd counties affected by the law.

It may be true that out of the thirty-five timber and prairie counties, in which the fire warden law is in operation, there are two or three counties in which the commissioners have for the past two years refused to pay any fire warden claims. But in so doing the commissioners put themselves in the wrong, because section 8 of the fire warden law makes it their duty to audit such claims. If any claims are excessive they should be rejected, but it is illegal and unjust, besides demoralizing to the service, for any board of county commissioners to refuse to audit any reasonable and just accounts.

#### COMPETENT OUTSIDE OPINIONS OF MINNESOTA'S FIRE WARDEN LAW.

The *Pioneer Press* of April 6 contained the following special dispatch from Washington, reporting the views of the Commissioner of the United States General Land Office, and of the Chief of the Division of Forestry, in regard to our fire warden system:

#### PROTECT THE TIMBER.

LAND COMMISSIONER SURPRISED AT MINNESOTA'S SUGGESTION—INSTEAD OF REPEALING THE LAW FOR PROTECTION AGAINST FIRE IN TIMBER, THE LAW SHOULD BE MORE STRINGENT—OTHER STATES ARE MAKING LAWS ON THIS SUBJECT—THE VALUE OF TIMBER DESTROYED BY A SINGLE FIRE WOULD COMPENSATE FOR SEVERAL YEARS' APPROPRIATIONS.

[From *Pioneer Press*  
*Washington Bureau.*]

WASHINGTON, April 5.—Commissioner Hermann, of the General Land Office, today expressed surprise at the report that a suggestion is made in the Minnesota legislature to repeal the law for protection against fire in the timber within the state. Mr. Hermann is deeply interested in this subject. He said :

"Instead of repealing the law it should be made more stringent, and every effort made to bring about coöperation with the federal authorities. In many instances the public timber of the United States and of a state are so contiguous as to make protection of one protection of the other. This should be mutually in the matter of surveillance. The tendency of most states is to protect the timber interests, and recent legislation in New York is in the interest of forest preservation in the Adirondack region. I have noted with interest the relation of Minnesota to timber interests. The state lands of Minnesota aggregate a great deal, and an important part of their value comes from the timber contained on those lands. The forests of that state, I presume, in common with the forests of the general government, are subjected to great depredations, and the greatest depredator of all is the fire fiend. The loss sustained in one of the last notable fires aggregated more than would compensate for fifty years' appropriations for the administration of forestry. This subject is of great importance to Minnesota, and I cannot understand why it is proposed to relax from the

#### MOST EFFICIENT EFFORTS

that can be made for the protection of her forest interests. The chief difficulty we have experienced is to secure active coöperation on the part of the states with the federal authorities in aid of prevention and extinguishment of fires, as well as in the apprehension of depredators on forest lands. Efforts should be made by the legislatures in all states to make their legislation in line with that of the federal government. I have urged that the forest rangers on the several reservations should be better equipped to enforce the law. Our department has asked the attorney general of the United States to have United States marshals deputize the rangers to make arrests for offenses committed in defiance of forest regulations. I have been in some correspondence with executive officers in different states asking that coöperation may be had on the part of forest wardens of such states with government officials, which would inure to the benefit of the federal and state interests. I would be glad also if the federal forestry officers could have authority to act as game wardens, so that while protecting timber interests they could also aid in protecting game on the reservations without additional cost to the state.

"The state laws of Minnesota for the protection of timber interests are equal, if not superior, to those of any state, and the annual reports of the state officials contain much interesting and valuable information, and it is to be hoped that the state authorities will strengthen rather than detract from the efficiency of their laws for forest preservation. This forestry question is becoming more important every year, and

statistics show that if losses by fires are not speedily checked our great timber interests will soon be things of the past. State and federal authorities in this country may with profit study the results and experiences of Prussia and other European countries in promoting their export trade in timber by wise national laws for forestry preservation and development."

#### OURS IS ONE OF THE BEST LAWS.

Chief Pinchot, of the Division of Forestry of the Agricultural Department, is familiar with Minnesota's law to prevent forest fires and regards it as one of the best in force. He is at a loss as to the object contemplated in the proposed repeal of the law. He said :

"If the bill under consideration is intended to do away with the office of chief fire warden and suspend the work which has been conducted by General Andrews, I disapprove of it heartily. Whatever the actual accomplishment of General Andrews during his tenure of this office, and in my judgment the good he has done is very great, the mere fact that there is a law on the statute books intended to guard against the damage from forest fires is in itself of great value. Protection against fire can never be fully successful until it is based on an active and healthy public sentiment.

"Such sentiment, as I understand it, the present law has done very much to promote. That it is capable of improvement I have no doubt, but to repeal it instead of improving it would be a backward step so considerable, especially in view of the enormous loss of life and property caused by so recent a conflagration as the great Hinckley fire, that I hope most heartily the bill to repeal the Minnesota fire law will not pass. I am not informed whether this bill is intended to do away with the fire law of Minnesota or merely that part of it which concerns forest fires. The Minnesota law is one of the best and most progressive in force in any of the states, and it would be a national misfortune if it should be repealed. Public sentiment throughout the country has made such important strides in the last three or four years in the direction of a keener and more effective interest in forest protection that the retrograde step apparently contemplated is all the more to be regretted."

#### PUNISHMENT FOR NEGLIGENCE UNDER THE FIRE WARDEN LAW.

On the 5th of May last, during dry weather, a man in the town of Staples, Todd county, carelessly set a fire, which spread half a mile into a neighbor's field, where it



fatally burned a woman who was trying to save a team, and severely burned a boy who tried to protect her. Under our fire warden law, which punishes people for carelessness in causing forest and prairie fires which injure or endanger others, the chairman of the town board, acting as fire warden, had the offender arrested, and he was made to pay a fine of \$100 and costs. There were several other vigorous and effective prosecutions.

### FOREST FIRES, 1898.

Reports from fire wardens, made to the Chief Fire Warden, of forest fires in 1898, show that there were fifty-one such fires, and which burned over 21,580 acres, much of which was light timber or cut-over land. Total damage reported, \$9,063, which seems very small, and is accounted for in part by some damaged timber being cut the following winter. Forty of these fires, or 78 per cent of the whole number, were extinguished or controlled by fire wardens and their helpers.

### SUMMARY OF FOREST FIRES, 1898.

COUNTY AND TOWNS.	Date.	Acres.	Dam'ge	Cause.	Controlled or Extinguished by Fire Warden or Helper.
<b>Becker County—</b>					
Green Valley.....	April 14	50	\$40	Unknown .....	Yes.
Green Valley.....	April 18	60	20	Unknown .....	Yes.
Height of Land.....	May 15	2,000	2,000	Unknown .....	Yes.
Runeberg.....	May 20	.....	100	Unknown .....	Yes.
<b>Beltrami County—</b>					
Bear Creek.....	May 17	960	40	Burning meadow...	Yes.
Buena Vista.....	May 28	400	1,000	Hunt'rs or camp'rs	Yes.
Leon.....	May 10	200	.....	Camp fire.	
Leon.....	May 15	400	100	Burning brush.	
Moose Creek.....	May 12	1,000	None	Burning brush.	
Township 148-32.....	May 16	300	200	Campers .....	Yes.
Township 143-36.....	May 17	50	50	Campers .....	Yes.
Township 145-37.....	May 16	160	.....	Campers .....	Yes.
Township 146-37.....	May 14	8,320	848	Unknown.	
Shevlin.....	May 15	400	200	Unknown.	
<b>Benton County—</b>					
Maywood.....	May 8	40	1,000	Burning brush.....	Yes.
<b>Cook County—</b>					
Township 61-1.....	May 16	80	250	Unknown. ....	Yes.

## SUMMARY OF FOREST FIRES—Continued.

COUNTY AND TOWNS.	Date.	Acres.	Dam'ge	Cause.	Controlled or Extinguished by Fire Warden or Helper.
<b>Crow Wing County—</b>					
St. Mathias.....	April 10	640	None	Unknown. ....	Yes.
Township 136-29....	May 14	30	None	Unknown.	
Crow Wing.....	May 2	640	100	Unknown. ....	Yes.
Township 136-39....	May 16	100	150	Unknown. ....	Yes.
Township 138-27....	May 6	3,600	500	Burning brush.....	Yes.
Township 135-28....	May 14	300	100	Campers.....	Yes.
<b>Douglas County—</b>					
Carlos.....	April 26	300	150	Unknown.....	Yes.
<b>Hubbard County—</b>					
Crow Wing Lake...	May 15	3,000	200	River drivers.....	Yes.
Henrietta.....	April 24	1,000	100	Burning brush.	
Henrietta.....	April 29	50	.....	Unknown.....	Yes.
Lake Emma.....	May 14	1,000	40	Unknown.....	Yes.
Lake Emma.....	May 16	80	30	Unknown.....	Yes.
White Oak.....	May 29	1,200	100	Unknown.....	Yes.
<b>Isanti County—</b>					
Stanford.....	May 5	50	20	Clearing land.....	Yes.
<b>Itasca County—</b>					
Deer River.....	April 20	500	1,200	Logging loc'motive	Yes.
Township 60-22....	June 28	50	150	Unknown.....	Yes.
Township 152-26....	May 10	40	200	Hunters.....	Yes.
<b>Kanabec County—</b>					
Knife Lake.....	May 12	350	50	Unknown.....	Yes.
<b>Lake County—</b>					
Two Harbors.....	May 10	.....	2,000	Clearing land.....	Yes.
<b>Marshall County—</b>					
Nilson Park.....	May 3	600	50	Campers.....	Yes.
Nilson Park.....	May 16	1,000	30	Unknown.....	Yes.
<b>Mille Lacs County—</b>					
Robbins.....	May 17	40	30	Unknown.....	Yes.
South Harbor.....	May 9	300	300	Indian campers.....	Yes.
<b>Morrison County—</b>					
Clough.....	May 9	300	200	Unknown.....	Yes.
<b>Otter Tail County—</b>					
Oak Valley.....	April 24	20	75	Clearing land.	
Rush Lake.....	May 19	300	300	Unknown.....	Yes.
<b>Pine County—</b>					
Brook Park.....	April 22	100	.....	Clearing land.	
Brook Park.....	April 29	300	50	Clearing land.	
Hinckley.....	May 7	125	65	R. R. locomotive...	Yes.
Finlayson.....	May 14	5,000	2,000	Unknown.....	Yes.
<b>St. Louis County—</b>					
Dinham.....	April 27	10	15	Unknown.....	Yes.
Dinham.....	May 15	640	50	Unknown.	
Kelsey.....	May 17	160	None	Burning fire break.	Yes.
McDavitt.....	May 26	20	None	Unknown.	
<b>Todd County—</b>					
Staples.....	May 5	160	.....	Burning meadow...	Yes.
Villard.....	May 15	1,200	75	Unknown.....	Yes.

Total acres burned over, 21,580. Damage, \$9,063.

Classification of causes:

From clearing land, 5.

From burning brush and meadow, 6.

From camp fires and hunters, 9.

From logging locomotive, 1.

From railroad locomotive, 1.

From other causes, 2.

Unknown, 27.

Total number of fires, 51; 78 per cent controlled or extinguished by fire warden.

#### REPORTS OF FIRE WARDENS OF FOREST FIRES IN 1898.

##### BECKER COUNTY.

Andrew Bjorkkel, chairman of the town of Green Valley, May 4th:

April 18th, a fire, which originated on sections 17 and 19, burned over 60 acres of brush and timber and destroyed 5,000 feet of white pine timber. It was extinguished in eight hours after it started by ditching, etc.

May 24th he reports that on the 14th of April a fire on section 27 burned over 50 acres of brush and heavy timber and destroyed 10,000 feet of white pine timber; was extinguished by another person and himself in six hours after it started by ditching.

Albert Wothe, chairman of the town of Height of Land, June 27th:

May 15th, a fire, which originated from cause unknown, on section 8, burned over 2,000 acres of heavy timber. Damage \$5,000. Weather dry and windy. Twenty-two persons were called to help extinguish it with team and plows, hoes and shovels until the rain came and helped put it out. [A subsequent careful examination resulted in placing the damage at \$2,000.]

Frank W. Lindeen, of the town of Runeberg, December 30th:

About the 20th of May a fire was set on section 16, wind being strong, and burned timber of the value of \$100.

##### BENTON COUNTY.

Jerry Keefe, chairman of the town of Maywood, May 12th:

A fire occurred on section 19, on the 8th of May, and burned over 40 acres of timber and field. It originated on land occupied by S. S. Davis, and was caused by burning brush. It destroyed 500 cords of maple wood belonging to Mr. Robbins of Willmar, of the value of \$1,000. The weather was very dry. Five persons were called to help extinguish the fire, which was done by the use of water and teams. We hauled away wood and made an open space between the wood belonging to Robbins and about 2,000 cords of wood belonging to other parties and which we saved. J. P. Hurt and Robert Rucker rendered praiseworthy service.



White pines left from a clearing, showing appearance of the trees grown in close stand. In Carlton County; Fosston extension railroad in course of construction. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



## BELTRAMI COUNTY.

J. W. Speelman, of Buena Vista, May 16th:

A forest fire occurred in the south part of town 148, range 33, May 28th, and burned over 400 acres of light timber; damage, about \$1,000; caused by hunters or campers. Extinguished by rain and backfiring.

Michael Spain, chairman of the town of Moose Creek, May 18th:

A fire occurred the 12th instant, originating on section 3, and burned over 1,000 acres of pine cuttings; no damage. Weather very dry. Fifteen persons assisted in extinguishing the fire. It was extinguished by rain on the night of the 17th instant.

Charles Fleischman, of Buena Vista, May 17th:

There was a forest fire on section 5, town 148, range 32, and on sections 32 and 33 of town 149, range 32. It started alongside of the roadway about 10 o'clock, Monday, May 16th; I put it out as much as I could that afternoon, with the help of another man, and the balance that night. Two claim holders' shanties were in danger of being burned. We had to build counter fires to get up to it. It burned over about 300 acres of standing hard wood, pine and balsam timber. There is more fire south of here, where I will go to-day to see. There are very many men running through the woods looking for land, and the season so far has been very dry, no rain for a month.

Michael Kelly, of Red Lake, June 1st:

The fires we have had so far this spring have done no damage that I can see. So far the weather has been so cold that fires did not run very strong, although there were a great many of them scattered through the country. They are all out now. Most of the fires come from men tramping the country, camping out, building fires and letting them get away from them; and this country is full of such tramps.

Charles E. Scott, of Park Rapids, May 18th:

A forest fire occurred May 17th on section 13, town 143, range 36 (Itasca State Park), and burned over brush and timber. Weather dry and windy until evening, when there was rain. I was called on by the Superintendent of the State Park. Fire was extinguished by digging earth and putting on it, and we got it all out with the help of a good heavy rain on the 18th about 2 o'clock in the afternoon.

Adolf F. Johanson, of Moose, June 8th:

May 16th a fire originating on section 1 of town 145, range 37, burned over 160 acres of brush and meadow; it did no damage of any amount; was extinguished by backfiring in some places, and in other places it went out itself. Weather warm, dry and windy. Has been a big fire in the pine woods in town 146, range 37.

Ole J. Shinn, of the town of Bear Creek (145, range 36), June 10th:

May 17th and 18th a fire which originated on section 2, from settlers burning meadow, burned over about 960 acres of light poplar and destroyed one claim shanty; damage, \$40. Nine persons were called to help extinguish

the fire, which was done by backfiring and using wet sacks. Fire Warden Ole J. Almquist was present and assisted in controlling and extinguishing the fire. Weather dry and warm.

O. A. Nerhus, chairman of the town of Leon, June 12th:

On the 10th of May a fire on section 7 (northwest part of town) burned over 200 acres of brush and meadow, but did scarcely any damage. It started from a camp fire and was extinguished by a road running north and south, the wind being from the west. Weather clear and quite windy.

A fire on section 15, cause unknown, was extinguished two hours after it started by myself, James Ellis, S. Tisdall and Peter Fosberg; it did no damage.

In my town fire has been very limited; no damage has been done except the burning of some hay and two stables which were settled for.

H. Peck, of town 147, range 36, July 10th:

A brush fire May 15th burned over 400 acres and destroyed some timber on sections 1 and 2. None were called to help extinguish it. Weather dry and windy.

Adolf F. Johanson, of Moose, December 9th:

A forest fire on the 14th of May burned over 8,320 acres of mostly light timber and did damage to the amount of \$848. It originated on section 2, town 146, range 37, from cause unknown; the weather was dry and windy. The fire was extinguished by rain.

#### COOK COUNTY.

Frank La Sage, of township 61, range 1 east, May 21st:

A fire occurred on section 4, May 16th, which burned over 80 acres of light timber; damage, \$250. Three persons were called to help extinguish the fire, which was done by backfiring.

Gust L. Peterson, of townships 61 and 62, range 4 west (P. O. Lutsen), October 13th:

There have been only some small fires, which I put out.

#### CROW WING COUNTY.

Millard Shannon, chairman of the town of St. Mathias, May 9th:

A fire occurred April 10th on section 25, and burned over 640 acres of brush land; no property destroyed. It was extinguished in seven hours after it started by the good work of several settlers. Weather dry and windy.

T. G. Butler, of township 136, range 29, May 26th:

On the 14th of May a fire which originated on section 10 passed south along Sibley lake to Mayo brook and went out. It was thought to have been caused by some one smoking.

May 16th a fire near Cullen lake in the south part of township 136, range 39, destroyed some standing timber and 100 cords of wood. It was first reported by the conductor of the Brainerd & Northern railroad, about 4 p. m.

The fire was then east of the track and about four miles below Sibley station. The section men were all there. Three persons were called by the section men to help put out the fire. Weather very dry and wind from the east. The damage done by these fires is not very great.

H. G. Butterfield, of Cross Lake, June 16th:

A fire on the 6th of May, which originated on section 26, town 138, range 27, and which was caused by burning brush on a very dry and windy day, burned over 3,600 acres of light timber and meadow, and destroyed a small amount of second growth pine; damage, \$500. Six persons, including myself, assisted in extinguishing the fire by backfiring, using wet sacks attached to a pole, and by plowing a double furrow. I say the fire was extinguished, that is, we succeeded in putting it out so as to protect the best part of the township; but on the northeast the fire was so fierce that it could not be controlled, hence it ran east to Little Pine river, where it stopped for want of combustibles.

Freeman Thorpe, of Hubert, June 27th:

May 14th a fire on section 7 burned over 300 acres of light timber, destroyed the blueberries and considerable hardwood; damage, \$100 (tie stump land). Twelve persons were called to help extinguish the fire, which was done by throwing sand along the line of fire and whipping it with green boughs. After extinguishment two men patrolled the line for two days, and extinguished the fire whenever it started up, which it did many times. The weather was very dry, with considerable wind. All the men called dropped everything and rushed immediately to the fire, and did effective work, carrying out my directions faithfully and intelligently. The fire approached very near to three homesteaders' buildings, but their owners fought the fire along the general line wherever I posted them without question.

James K. Gardner, chairman of the town of Crow Wing, without date (received December 15th):

May 2d a fire burned over 640 acres of partly field, prairie and forest, and destroyed a few second growth of jack pine of no value (?). Cause unknown, and I was unable to find out. The fire was whipped out, fifteen hours after it started, by the help of eight persons.

#### DOUGLAS COUNTY.

G. A. Anderson, chairman of the town of Carlos, May 2d:

April 26th a fire on section 5 burned over 300 acres of brush and light timber, but did no other damage than destroying some of the young timber. A stormy south wind was blowing. The fire was extinguished in nine hours after it started by four persons making a clean path and setting backfire; and where water was near wet sacks were used.

#### HUBBARD COUNTY.

Lon Dutton, chairman of the town of Lake Emma, May 19th:

On the 14th instant a fire which originated from cause unknown on section 5, township 141, range 34, burned over three sections of mostly poplar



and some pine, damage possibly \$30 or \$40. It was extinguished by building backfires. Weather very dry and windy. U. G. Kempton, fire warden, first discovered the fire about 11 o'clock Saturday morning; he called some people living in his vicinity to help him. Seven persons assisted in extinguishing the fire, which was accomplished in thirty hours after it started.

May 16th, 9 P. M., a fire in the east part of township 141, range 34, burned over about 80 acres of light timber. It came into our town from the east. Two of the supervisors (fire wardens), U. G. Kempton and D. J. Johnson, were at this fire as soon as they learned of it. It was extinguished by making a backfire between Mud lake and a marsh. Weather very dry and windy.

C. H. Yeager, chairman of the town of Henrietta, May 21st:

A fire, April 24th, which started on section 23 (town 140, range 34), burned over 1,000 acres of mostly prairie and some jack pine. It burned through to the Crow Wing river; there was no use calling any help, for it could only go to the lake and river. I think it was set by men who own land on the same section and who live here. It was set so that it would burn their land over. It destroyed two miles of fence; no other damage. The fence was not much good. The timber that was burned is on land that will be cleared up and farmed soon, for some of it is being cleared and broke now, so the fire did more good than damage, except the fence.

April 29th there was a fire on sections 20 and 21. It was set in five different places, with the intention of burning over about 15 sections of small timber, jack pine and Norway, some poplar. It was set in the thick timber about 3 o'clock in the afternoon, and made slow progress; it burned over about 50 acres, and was put out by rain. About 6 o'clock I was in this locality and saw smoke, and went to see what it meant; the fire was about half an acre in size, so I was going to get help to stop it, but when I got about half a mile I found another fire, so I stopped to look after the men who set it, but I cannot find any positive proof, as there were so many people over the road that afternoon.

J. W. S. Reightly, chairman of the town of Crow Wing Lake, May 30th:

About the middle of this month a forest fire, caused, I think, by river drivers, burned over about the north half of town 140, range 33, burning some of the slashings that were cut last winter. It did not do very much damage so far as I could see. We had a rain ten days ago that put a stop to it. I kept a watch around here and did all that I could to keep fire out of my town; the weather was warm and dry. There are lots of men coming from other places and running all over the country looking for land.

A. O. Paulson, of townships 144 and 145, range 32, Graceland, June 3d:

On the 14th of May, a fire, which originated on section 28 from parties burning meadow in order to obtain more grass for hay, burned over 60 acres of mostly dead and down timber, and destroyed a young growth of pine and poplar. Weather very dry. It was extinguished the evening of May 17th by a heavy shower of rain. At the time the fire started I was away from home, and did not return till the 18th of May. The principal danger of fires up in this region of country is from clearing land. I have talked with quite a num-

ber of settlers and cautioned them to be very careful when clearing their land not to let the fire get away; and I think the best way of lessening it would be to have a man do nothing else in the day time but watch those places.

John F. Nichols, chairman of the town of White Oak, November 7th:

A forest fire, May 29th, in the northeast part of the town burned over about 1,200 acres of light timber and destroyed a small amount of green timber; it originated in Cass county, cause unknown; supposed to be from railroad. Weather was dry and windy. I had a half dozen men ready for work when a rain set in and extinguished the flames.

#### ISANTI COUNTY.

John E. Palm, chairman of the town of Stanford, May 14th:

On the 5th of May a fire burned over 50 acres of light timber and destroyed the new grass for pasturing; damage, \$20. It originated on section 4, where there had been burning a clearing the day before. It was started the next morning by a heavy wind. It was extinguished by team and plow and by the use of wet mops. I was assisted by Victor Palm. The weather was dry with a northeasterly high wind.

#### ITASCA COUNTY.

James Woolford, of the town of Deer River, June 27th:

April 20th a fire which originated on section 36, town 146, range 25, and caused by a locomotive on the Itasca logging road, burned over 500 acres of partly heavy pine and partly swamp; damage to timber, \$1,200. The fire was put out with water and wet sacks and by pounding the fire. Eight persons assisted. I was the only fire warden present. The weather was dry and windy.

August Amell, of Bridge, October 7th:

On the 10th of May, a fire caused by hunters camped on section 26, township 152, range 26, burned over 40 acres of light timber; damage, \$200. Weather very dry. The fire was extinguished ten hours after it started by shoveling up the soil and scraping up the leaves and rubbish around the fire. I extinguished it myself.

Edward Spring, of unorganized township 60, range 22, November 12th:

On the 28th of June, a fire on section 21, burned over 50 acres of brush and light timber and destroyed jack pine, birch and spruce; damage, \$100 to \$150. Three persons assisted in extinguishing the fire, which was done by backfiring and trenching.

#### KANABEC COUNTY.

E. O. Mellgren, chairman of the town of Knife Lake, July 11th:

On the 12th of May, a fire which originated on section 24 from cause unknown, burned over 350 acres of brush and meadow land; damage, \$50. Weather dry and windy. The fire was extinguished 15 hours after it started by the help of J. O. Thelander, fire warden, and nine others.

## LAKE COUNTY.

Thos. Owens, Supt. Duluth & Iron Range Railroad Co., Two Harbors, May 9th, (telegram):

Weather clear, dry, high wind; fire started Friday last three miles west of track. Nothing serious.

Same, May 9th, 4:18 P. M. (telegram): Town 53 still burning, but under control; no villages in danger.

Same, May 10th (telegram), 8:30 A. M.: Fire in town 53, range 10, destroyed about one million feet of logs banked on lake four miles east of here; fire tugs were used; fire now quenched; logs owned by Richardson & Avery.

Same, May 11th: Referring to your letter of 9th inst., I should have stated in my telegram, town 53, range 11, and in section 33, which is about three miles away from our road. There are quite a number of settlers locating in this vicinity, and a large number of these fires start on account of the work which they are doing towards clearing their land. The fire referred to was controlled by the men in our employ, but was easy to control, as it burned to the track.

Same, May 13th: Replying to your letter of 10th instant in regard to the origin of the fire which burned the logs on Flood bay, beg to say that there are several farmers located in section 29-53-10, Lake county, and, while it is not definitely known, it is generally supposed that by their doing some clearing the fire ran to the pile of logs.

James H. Lunz, president of the village council of Two Harbors, May 10th:

Replying to yours of the 9th, will say, we have some heavy forest fires raging both west and north of here, about three miles distant, but they are on land from which the pine timber has been cut. The only damage so far was on the night of the 9th instant, three miles north of here; it burned about 300,000 feet of logs banked at the mouth of Stewart river on Lake Superior; logs got out by Scott & Halston's company for Richardson & Avery. We gave them all the aid we could to fight the fire. It is, in my opinion, impossible to fight fire in an old slashing.

Same, May 14th: Replying to yours of the 12th, will say, the fires in this vicinity were in 53-11 and 54-10. The logs were burned in town 54-10. The fires at this time, as far as I know, are all out. The chairman of the town board of Two Harbors was at the fires.

W. D. Lawrence, chairman of the town of Two Harbors (by telegram), May 12th:

We are doing all that is possible towards extinguishing fires.

Same, May 14th: On the 8th instant a fire in old slashings, which as near as I can learn started along the county road, burned over four acres of brush and destroyed about 300,000 feet of logs. Twenty-five persons were called and helped extinguish the fire. One tug was furnished by the Duluth & Iron Range Railway Company and one fire tug from Duluth. Hose was furnished by the village of Two Harbors. The logs were owned by Richardson & Avery, and were about three miles from town. Weather very dry and calm.



Norway pine forest on soil only about eight inches in depth lying upon a granite ledge; property of the State University and situated on north shore of Vermillion Lake. Treated on forestry principles the land would yield a sustained revenue, but if the pine be cut in the present usual manner the soil will gradually be washed away and nothing be left but bare rock. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



Waste land, in Beltrami County. There is a large amount of such land in Northern Minnesota which is now of no benefit to anyone. It would, however, bear pine forest, and if managed on forestry principles, it would earn and yield a fair net revenue and at the same time make the country look handsomer. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



W. D. Lawrence and James H. Lunz, fire wardens, were present; Richardson was there himself, also three members of the fire department of the village of Two Harbors.

## MARSHALL COUNTY.

N. C. Rood, chairman of the town of Nilson Park, May 19th:

A fire May 3d, which started on section 3 and caused, as I am informed, by land hunters, burned over 600 acres of brush, meadow and prairie; destroyed nothing but a couple of cords of poplar wood. It was extinguished by myself with the help of six other persons by backfiring and using wet sacks. Weather very windy. We saved several hundred dollars worth of property by being there so soon after the fire started.

Same, May 28th: A forest and prairie fire originating on section 36 occurred May 16th and 17th, burning over 1,000 acres of brush and poplar and which destroyed some cord wood; damage, \$30. Weather quite dry and windy. Eight persons were called and helped extinguish the fire, which was done with use of water and sacks, also some backfiring.

## MILLE LACS COUNTY.

W. H. Evans, of the town of Robbins, October 30th:

Last spring we had a forest fire here which for a time threatened to be quite serious, but by hard work all night long we got it under control and extinguished it. I had six men out on duty.

J. L. McQueen, chairman of the town of South Harbor, December 21st.

On the 9th of May a fire supposed to have been set by Indians, burned over 300 acres on sections 20, 28 and 29 and destroyed timber of the value of \$300. The fire was extinguished four days after it started by carrying water in pails and by beating the ground and with the use of wet sacks.

## MORRISON COUNTY.

E. S. Hall, chairman of the town of Clough, May 12th:

The 9th instant a forest fire on section 29 burned over 300 acres of light timber and destroyed some young pine and other young timber; damage, \$200. I do not know how it originated. Ten persons were called to help extinguish it, which was done with water and by throwing dirt upon it. Weather very dry and windy.

## OTTER TAIL COUNTY.

Frank Brauch, chairman of the town of Oak Valley, May 17th:

A forest and prairie fire April 24th, caused by clearing land the day before and where the fire was supposed to have been put out, burned over 20 acres and destroyed a stack of hay, two calves and a kit of carpenter's tools; damage, \$75. Three persons saved the house. Weather windy. The fire was extinguished by a good rain.

John F. Doll, chairman of the town of Rush Lake, June 8th:

May 19th a fire on section 15 burned over 300 acres of heavy timber, and did damage to the amount of \$300. I was assisted in putting out the fire by the help of four persons, which was done by plowing and backfiring. Weather clear and windy.

PINE COUNTY.

A. B. Ziegler, chairman of the town of Brook Park, May 10th:

April 22d a fire in the northwest part of the town burned over 100 acres of dead timber and heavy weeds where logging was done last winter. It did no damage. It was extinguished by backfiring and using wet sacks. The weather was and is yet very dry. The timber being dead, every one seems to think it is a good thing to burn the marshes and swamps.

On the 29th of April a fire on section 30, in the southwest part of the town, burned over 300 acres of partly dead and partly green timber. It is hard to tell the cause of the fire, as every settler is clearing his meadow; besides there are some Indians shooting about the woods all the year round. Yesterday there was a fire again in the southeast part of the town; I have asked some of the settlers if the fire was doing any damage, and they said no.

A. D. Leonard, chairman of the town of Hinckley, May 14th:

On the 7th of May a fire on section 34, caused by the Great Northern passenger train, burned over 125 acres tamarack and brush; destroyed 37 cords of tamarack wood; damage, \$65.60. Weather clear and windy—wind from south. It had been very dry all spring, only one little rain, which occurred one week previous to the fire, and which dried up very quick.

W. G. Sawyer, fire warden, Partridge, May 14th (telegram):

Serious forest fires raging, and they are beyond control. Town not threatened as yet. Answer.

Same, and operator May 14th (telegram), 9 P. M.:

Fire originated about six miles east; still running; cannot say how extensive. Burned until within a mile of town, and people backfired. No danger far as town is concerned unless heavy wind. No help needed at present.

J. A. Oldenburg, chairman of the town of Finlayson, May 14th:

Your message reached me to-night and I at once began to order out men to proceed to Partridge as per your instructions. One-half hour after receiving your message Mr. Sawyer wired me as follows: "We do not need help to quench fire," whereupon I stopped getting men and sent those I had collected to their respective homes.

W. G. Sawyer, of Partridge, May 16th:

Referring to my telegram of Saturday, will say that I wired you that the town was not in danger and so did not expect any help, but I telegraphed Sandstone, Finlayson and Rutledge not to send anyone, so no expense was incurred by my having wired you. The worst of the trouble is over, but most of the country has been burned over. I fought fire here two days with eight men, and will see you in a few days relative to the expense.

[In a subsequent conversation Mr. Sawyer expressed the opinion that the fire was caused by children who had been fishing.]

John A. Oldenburg, chairman of the town of Finlayson, May 20th [referring to above mentioned fire]:

A fire of May 8th burned over 5,000 acres of heavy and light timber and destroyed 2,000 acres of timber. I could not ascertain its origin, nobody seemed to know it. Eleven persons, including W. G. Sawyer, fire warden, assisted in controlling the fire, which was finally extinguished by rain.

G. T. Slade, Supt. Eastern Minnesota R'y Co., West Superior, May 17th (telegram):

Have been doing what I can to extinguish forest fires and will continue to watch and extinguish them.

#### ROSEAU COUNTY.

Telegraph operator, Stephen, Minn., May 16th (telegram):

No report from Roseau county about forest fire. As near as I can learn from stage driver, fire does not amount to much.

#### ST. LOUIS COUNTY.

President village council of Hibbing, May 10th:

Sunday last there was a small fire about two miles south of the village, but it burned itself out about. It is not quite dry enough for fire to travel much. We have some bad forest slashings in village limits.

J. W. Power, Hibbing, May 11th:

As attorney for the village I have been instructed to write you relative to the heavy pine slashings to the north, south and west of the village. I have notified the owners of the property, but in each instance have received no satisfaction, and the council, realizing the danger of the destruction of the village in case these slashings were fired, believe the matter should be taken care of by the State Warden; they have not the means to destroy this nuisance. Some of the slashings are within one mile of the main street, and, the spring so far being very dry, the danger of the fire is greatly increased. There have been 80,000,000 feet of pine cut in this vicinity during the past winter, and you can from that figure get some idea of the enormous amount of slashing there is. To the south of the village there has been a big fire for the last three days, and no rain. Let me hear from you on the subject.

J. W. Kreitter, Supt. Duluth, Missabe & Northern Railroad Co. Duluth, May 10th (telegram):

A few small forest fires along line, but not serious. Weather been very dry.

Same, May 12th: I am in receipt of your letter of May 10th, and in reply would state, that all of our men have instructions that they must positively put out, if it is within their power and force, all forest fires on or near our right of way, and we have never yet had a serious right of way fire. All of our engines receive daily inspection as to their stack netting, and all employees are cautioned two or three times a season about the seriousness of



setting, or allowing to be set, any fires along the line at an unseasonable time. We had a very slight rain yesterday, but the weather continues to keep dry.

No fires on the line to-day.

Henry Kirk, chairman of the town of Duluth, May 12th:

In regard to those fires, I would have written to you before now, but I have been away from home for some time. There is some fire in section 27, town 53, range 12, also in sections 22 and 34, set by men camping out, but the fire has not done much damage yet, as it is in where there was fire four years ago. I did not call out any help, as it looked to me impossible to put the fire out. The weather has been dry and warm for the last three weeks. Cool to-day; no fires burning to any amount.

J. D. Murphy, mayor of Tower, May 11th:

If there are any forest fires between Duluth and Tower I know nothing of it. I have been absent from home for the last week, and to-day have been informed that there are some fires in the forests north and northwest of Tower, and, as my informant put it, some bad fires at that. We are having some rain to-day, which I hope will help put out these fires. If you want me to go and investigate their extent and help to extinguish same, let me hear from you by return mail.

Same, May 13th (telegram): Fires are still smouldering five to fifteen miles from Tower. Nothing serious at present.

Same, May 16th: Sorry to say that since I answered your telegram forest fires have started up all around, so really I do not know which direction to go. There is a saw mill located on the line of the Duluth & Iron Range Railway some fifteen miles south of here (Norway). Word has just reached me this evening that all their sawed lumber was burned to-day; write or wire me at once. Everything is as dry as tinder; the rain we had did not amount to much.

Thos. Owens, Supt. Duluth & Iron Range Railway Co., May 17th (telegram):

The fire at Norway was not caused by forest fires. There are a few small forest fires along road, nothing serious.

Same, May 19th: Answering your letter of the 17th instant in regard to the lumber and mill that were burned at Norway on our line, beg to say that Norway is located in town 60 north, range 15 west, section 10, St. Louis county. We have had a good rain storm, which has greatly reduced the risk.

E. D. Hughs, of Embarrass, May 26th:

Regarding the late fire at Norway (a mile and a half from my office), when owners quit sawing lumber and moved away they left a large pile of sawdust burning close to lumber and no one to watch it. The surrounding country is tamarack, spruce, pine and brush. The day of fire the wind was blowing direct from fire in sawdust towards the lumber, and no doubt was cause of fire in lumber, as there was no forest fire near there. The late rains have extinguished about all the small fires that were around here.

Same, June 15th: The water supply is at mill that was burned down, and will have to be carried about 100 feet. Will start to extinguish the fire to-morrow morning, and will guarantee that the sawdust will be thoroughly

shoveled over and all the fire extinguished. I will personally attend to this matter and see that it is done thoroughly, and that fire is extinguished absolutely.

John McKay, chairman of the town of Floodwood, May 13th:

On the 4th instant a fire burned over 100 acres of brush and light timber on section 6, occupied as the townsite of Floodwood. It took place under the instructions of the board of supervisors and with their assistance, in burning the slashings that had accumulated here for several years, taking three different days to burn, according to the wind. We burned the brush, making our little place here comparatively safe, and did not a cent's worth of damage to any one.

D. R. Murphy, Supt. Duluth, Miss. River & Nor. Railway, Hibbing, May 17th (telegram):

Our men have orders to prevent fire spreading. Occasionally a slashing burning. Standing timber not harmed yet. Weather continues dry.

J. W. Kreitter, Supt. Duluth, Missabe & Northern Railroad Company, Duluth, May 17th (telegram):

Not much fire along our line; few places, but our men keeping track of them. If anything serious will put them in charge of outside persons and send bill of expense. Weather still very dry and no prospects for rain.

D. M. Philbin, General Superintendent Duluth, Superior & Western Railway Company, Duluth, May 17th (telegram):

Some small fires near Grand Rapids, but not close to our tracks. Woods very dry and much danger. Will do everything possible to extinguish and prevent fires.

Clyde Bender, recorder village of Sparta, May 17th:

The village board would respectfully call your attention to the bad condition of lands adjoining this village, which, owing to the fallen timber, etc., on same, is a menace to the village through the liability of fire. Your attention to this is solicited. The country in this vicinity is very dry at present, and, as we have had no rain, there is much danger of destructive forest fires.

William McComber, chairman of the town of Dinham, May 21st:

A fire occurred on section 12, April 27th, which burned over ten acres of field and destroyed 300 feet of fence; damage, \$15. It was extinguished in four hours after it started by carrying water in pails. A heavy southwest wind was blowing.

Edward Hunter, of the town of Dinham, June 27th:

May 15th a fire originating on section 16 burned over 640 acres of partly light timber and destroyed one logging camp; damage, \$50. The weather was hot and dry. No one was called to help extinguish the fire, for there are only two men that live within five miles of me, and they had to watch their property. It was all I could do to save mine. It is not known how the fire originated.

Wesley Mathews, chairman of the town of Kelsey, May 27th:

On the 17th instant a fire in the south part of town 53, range 18, burned over 160 acres or more of cut-over pine land, but destroyed nothing of any value. Parties had cleared up some old logging tops around a county road bridge, and were burning them up to safeguard the bridge, when the fire suddenly got beyond their control. It was extinguished four hours after it started, four persons assisting. It mostly burned itself out. When it got through the old choppings into the green timber it stopped, and, rain coming on that evening, put it out completely. The weather was very dry and hot when the fire started. The fire threatened at one time to burn up a large quantity of logs banked in the small creek, but by heroic efforts on the part of the men who were clearing to save the bridge, no damage was done to the logs.

J. L. Greatsinger, president and general manager Duluth & Iron Range Railway Company, Duluth, September 22d:

Replying to yours of the 21st instant. There are practically no fires on the line of our road this year, and in fact probably less than we have ever known before. It is a great problem as to where all this smoke comes from that is on Lake Superior. It must come from the north, as the prevailing winds have been in that direction, probably from Canada.

P. W. Scott, president of the village council, Virginia, September 2d (telegram):

No danger at present. I am watching closely.

Same, September 21st (telegram): Had a small fire in 59-63, but it is all out. No more danger at present.

J. D. Murphy, mayor of Tower, September 21st (telegram):

No signs of forest fires in this neighborhood.

Dagobert Mayer, chairman of the town of McDavitt, October 15th:

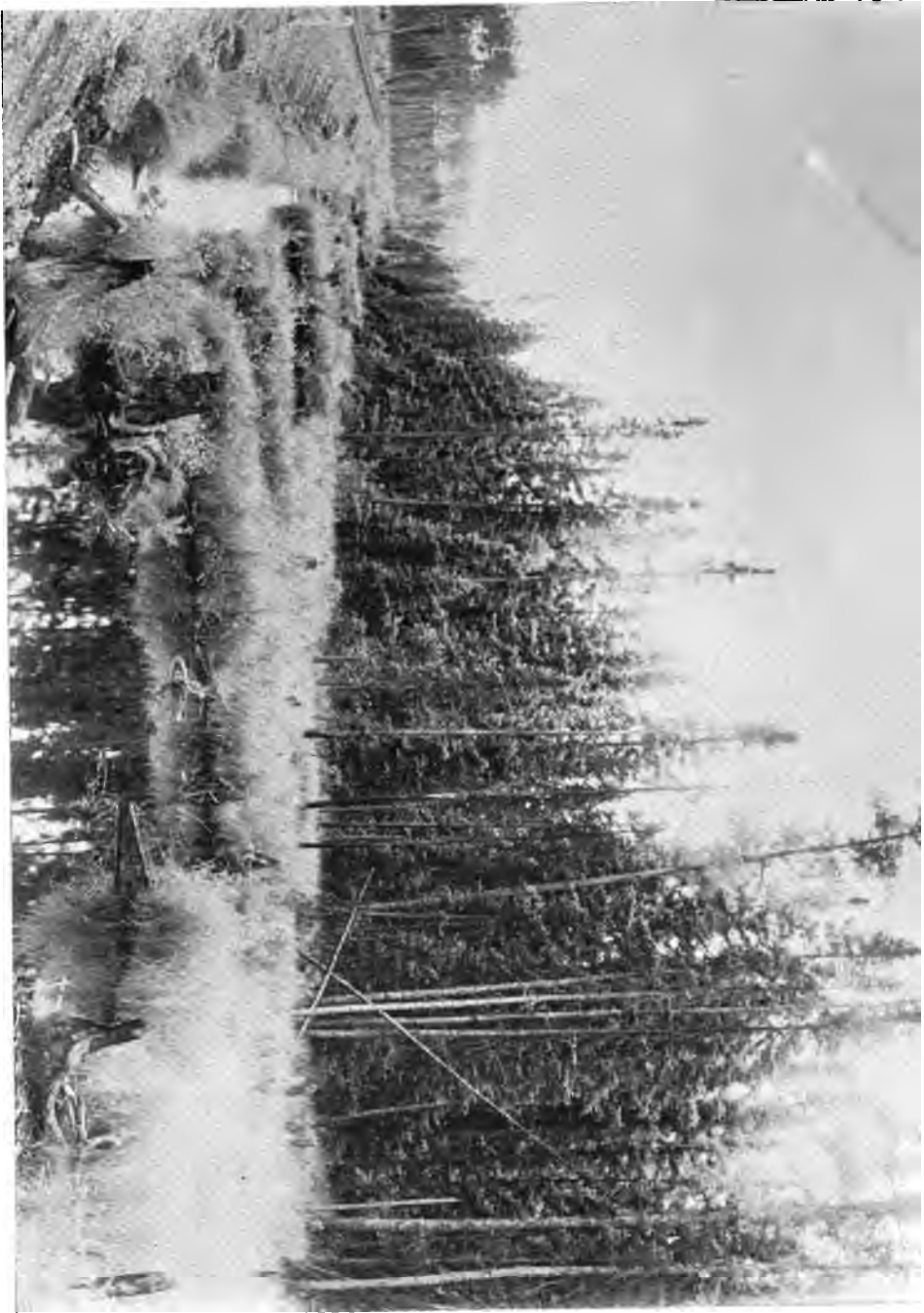
A fire May 26th on section 16 burned over 20 acres of logging slashing. It did not do any damage. Could not find out how it originated. Was extinguished by rain. The weather was dry for three weeks.

#### TODD COUNTY.

H. C. Miller, chairman of the town of Staples, May 14th:

May 5th a field fire on section 5 burned over 160 acres of marsh. It burned Mary Jane Halliday, aged 72 years, severely; also Luther Hall, aged 23 years. Mr. Hall, father of the boy that was badly burned, states that one Wyman Montgomery set the fire. I understand that he has left the country. Mrs. Halliday died; the boy is in bad shape and his folks very poor. The fire was extinguished eight hours after it started by three persons whipping it with coarse sacks.

Same, May 21st: Replying to yours of the 17th, regarding the field fire, it started on the southwest quarter of section 5. It was set by Mr. Montgomery, the owner of the land, for the purpose of burning the meadow and raspberry bushes. Mr. Joseph Hamberg, a neighbor of Montgomery's, saw him set the fire. Montgomery did not stay to watch the fire, but started for the village of Staples after setting the fire, and did not return to watch it. Mr. Halliday



Spruce forest near Wolf Junction, in St. Louis County, such as is being rapidly consumed in the manufacture of wood pulp; but no steps being taken for regrowth. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



and others were fighting the fire after it had spread onto section 6. Mr. Halliday's team was in the field, and Mrs. Halliday's clothes got on fire as she was trying to save the team. Young Hall had his hands badly burned as he was pulling the burning clothes from Mrs. Halliday. She lived about eight hours after being burned. The fire was set in the forenoon and burned until midnight; the weather was dry. Montgomery has not been seen since the fire; if found he should be arrested and prosecuted.

Same, June 1st: The distance from where the fire started to where it came in contact with Mrs. Halliday is about half a mile; the land is rolling and covered with bushes. I have had a warrant sworn out for the arrest of Montgomery and placed in the hands of the sheriff.

December 2d, Mr. Miller reported that Montgomery, on the 10th of June, plead guilty before a justice of the peace of carelessly setting a fire, and was fined \$100 and costs, which he paid. He states that Montgomery denied setting the fire that caused the death of Mrs. Halliday.

Frank Sears, chairman of the town of Villard, June 8th:

A brush and timber fire, starting from cause unknown, on section 13, May 15th, burned over 1,200 acres of meadow and timber, and destroyed hay of the value of \$50 and fencing of the value of \$25. It was extinguished in 30 hours after it started by plowing and backfiring. Weather hot and windy.

Same, June 12th: It started near an old road where there is a great deal of bicycling. There is a person we think set the fire, but we have no proof. Two families came near being burned out, and they are anxious to know who caused the fire.

#### SUMMARY OF PRAIRIE FIRES, 1898.

COUNTY AND TOWNS.	Date.	Acres.	Damage.	Cause.
Becker County—				
Atlanta.....	Sept. 20.....	300	\$40	Burning straw.
Atlanta.....	Sept. 20.....	450	50	Burning straw.
Big Stone County—				
Tokua.....	Oct. 10... ..	10	200	Unknown.
Clay County—				
Cromwell.....	May 7.....	100	20	Unknown.
Flowing.....	April 1.....	.....	100	Unknown.
Flowing.....	May 9.....	600	36	Unknown.
Flowing.....	Nov. 13.....	600	None	
Georgetown.....	Sept. 18.....	160	200	Burning straw.
Goose Prairie.....	April 10.....	320	200	Burning grass.
Hawley.....	Sept. 17.....	300	100	Railroad locomotive.
Hawley.....	Sept. 18.....	200	275	Railroad locomotive.
Keene.....	April 3.....	4,000	200	Unknown.
Riverton.....	Sept. 18.....	20	50	Railroad locomotive.
Riverton.....	Sept. 19.....	40	10	Railroad locomotive.
Riverton.....	Sept. 20.....	450	600	Railroad locomotive.
Riverton.....	Sept. 21.....	40	10	Railroad locomotive.
Riverton.....	Sept. 27.....	15	375	Railroad locomotive.

SUMMARY OF PRAIRIE FIRES, 1898—*Continued.*

COUNTY AND TOWNS.	Date.	Acres.	Damage.	Cause.
<b>Kittson County—</b>				
Deerwood.....	April 26.....	600	300	Unknown.
Deerwood.....	May 5.....	300	50	Unknown.
Poppleton.....	May 2.....	200	None	Unknown.
Poppleton.....	May 20.....	2,000	None	Burning brush.
Skane.....	April 11.....	450	20	Burning grass.
Skane.....	May 6.....	125	40	Burning grass.
<b>Lac qui Parle Co.—</b>				
Freeland.....	April 2.....	1,200	None	Unknown.
Garfield.....	Oct. 27.....	300	100	Threshing engine.
Lac qui Parle.....	May 1.....	7,000	.....	Hunters.
Manfred.....	April 2.....	6,000	.....	Unknown.
Manfred.....	April 7.....	300	600	Burning grass.
<b>Lincoln County—</b>				
Shaokaton.....	April 11.....	600	500	Burning grass.
<b>Marshall County—</b>				
Comstock.....	April 14.....	200	10	Burning grass.
Comstock.....	April 24.....	300	50	Burning grass.
Grand Plain.....	May 13.....	400	100	Indian reservation.
Stephen.....	April 18.....	160	300	Burning grass.
West Valley.....	Nov. 15.....	60	.....	Unknown.
<b>Murray County—</b>				
Ellsborough.....	April 16.....	640	.....	Unknown.
Ellsborough.....	Oct. 28.....	160	70	Burning straw.
<b>Norman County—</b>				
Good Hope.....	Nov. 5.....	3,060	300	Unknown.
Hegne.....	Nov. 3.....	1,240	2,500	Burning straw.
<b>Otter Tail County—</b>				
Carlisle.....	Sept. 21.....	50	180	Railroad locomotive.
<b>Polk County—</b>				
Crookston.....	April.....	20	30	Unknown.
Eden.....	May.....	10	10	Unknown.
Onstad.....	Sept. 20.....	100	200	Railroad locomotive.
Onstad.....	Sept. 27.....	1,900	3,000	Railroad locomotive.
Russia.....	Nov. 2.....	2,000	550	Railroad section men.
Kertsonville.....	Sept. 27.....	1,300	90	Railroad locomotive.
Vineland.....	Nov. 12.....	400	None	Burning fire breaks.
<b>Red Lake County—</b>				
Bray.....	April 24.....	200	30	Burning grass.
Emardville.....	May 14.....	200	20	Unknown.
Louisville.....	April 15.....	5,000	.....	Unknown.
Numedal.....	May 8.....	1,000	100	Unknown.
Poplar River.....	April 29.....	100	30	Burning grass.
Sanders.....	Nov. 2.....	300	40	Tobacco pipe.
<b>Redwood County—</b>				
Honner.....	Sept. 3.....	40	15	Railroad locomotive.
Springdale.....	April 26.....	80	200	Burning straw.
Vail.....	Sept. 19.....	160	6	Burning stubble.
<b>Stevens County—</b>				
Baker.....	Nov. 15.....	300	None	Unknown.
Hodges.....	Sept. 14.....	200	150	Railroad locomotive.
Scott.....	Sept. 17.....	800	250	Burning straw.

SUMMARY OF PRAIRIE FIRES, 1898—*Continued.*

COUNTY AND TOWNS.	Date.	Acres.	Damage.	Cause.
Todd County—				
Ward.....	April 12.....	600	80	Burning meadow.
Wilkin County—				
Akron.....	April 15.....	640	15	Burning grass.
Mitchell.....	March 4.....	600	None	Unknown.
Nordick.....	Sept. 3.....	20	None	Burning straw.
Roberts.....	Sept. 27.....	640	240	Unknown.
Yellow Medicine Co—				
Florida.....	Mch. 30.....	1,280	125	Unknown.
Florida.....	April 7.....	1,500	400	Burning straw.
Florida.....	April 27.....	620	200	From South Dakota.
Florida.....	Sept. 28.....	80	20	Railroad locomotive.
Norman.....	May 5.....	350	Slight	Unknown.

Total acres burned over, 54,360. Damage, \$13,436.

Classification of causes:

Burning grass, straw or stubble, 23.

Railroad locomotives, 14.

Other causes, 5.

Unknown, 25.

## REPORTS OF FIRE WARDENS OF PRAIRIE FIRES IN 1898.

## BECKER COUNTY.

C. N. Noben, chairman of the town of Atlanta, September 21st:

A prairie fire occurred September 20th on section 26, eastern part of town, and burned over 300 acres of prairie and meadow, damaged 100 acres of hay meadow; damage, \$40. There will not be any hay on the land next year, but of course year after next it will be all right again. The fire was caused by carelessness in burning straw without plowing around it. Fire was extinguished by plowing and fighting with wet sacks. Number assisting, three. The weather was dry, with a high wind from the south. Anton Venner did praiseworthy service with his plow and team at this fire, as he saved a man's hay and barn.

September 20th, a fire on section 22, land occupied by Ole J. Floten, and caused by carelessness in burning straw without plowing around it, burned 450 acres of prairie and meadow, and got into a grove of planted trees; damage, \$50. It was extinguished by two persons with myself by plowing and fighting it with wet sacks; there was a high wind from the south. Hans Eide did good work by plowing enough to save ten acres of trees. The parties who caused both of the fires reported suffered damage to their hay meadows.



## BIG STONE COUNTY.

Patrick Cawley, chairman of the town of Tokua, November 28th:

On the 10th of October a field fire on section 25 burned over 10 acres and destroyed one setting of wheat; damage, \$200; cause unknown. It was extinguished by the owners of the property by plowing and using wet sacks. Wind was blowing a gale.

## CLAY COUNTY.

P. J. Running, chairman of the town of Keene, April 8th:

On the 3d instant a prairie and stubble fire burned over 4,000 acres in the northwest part of the town, and destroyed grass and damaged grass roots. The fire came from the town of Hagen or farther north, where it had been seen to burn more than 24 hours before it reached this town. It was controlled by setting backfire along roads and using wet sacks, 14 persons helping. April 4th the wind changed to northeast; about 8 o'clock the fire started up again on section 17, and burned over that and into section 19, where three persons put it out with wet sacks along roads and fields and wherever practicable, and by setting backfires.

Peter Grambo, chairman of the town of Flowing, April 30th:

A prairie fire April 1st destroyed 50 tons of hay; cause unknown. The weather was dry and windy. I believe the fire started from a locomotive; I was away about one mile when I saw the fire.

Same, May 10th: A fire on the 9th instant burned over 600 acres of prairie and destroyed 12 tons of hay; damage, \$36; cause unknown. It was extinguished by John Flore, fire warden, with the help of another person.

Same, November 28th: November 13th a fire burned over 600 acres of prairie, but did no damage. Cause unknown. The weather was very windy. The fire was extinguished in eight hours after it started.

H. F. Burrill, chairman of the town of Hawley, September 17th:

A fire September 17th burned over about 300 acres of mostly prairie, and destroyed probably 40 tons of hay; damage \$100. It was caused by railroad locomotive. It was extinguished by a fire warden, with the help of other persons, by plowing furrows to head it off. Weather windy.

R. Hutchinson, chairman of the town of Georgetown, September 18th:

A field fire September 18th burned over 160 acres of stubble and flax; damage, \$200. It was caused by a threshing setting catching in stubble. The straw had been burned two weeks, and broke out again and ran in stubble. The weather had been dry for ten days.

Peter Wouters, chairman of the town of Cromwell, September 24th:

On the 7th of May a prairie fire, which originated in the town of Spring Prairie, burned over 100 acres in section 31; destroyed nothing but the prairie grass. It was extinguished in five hours by plowing and using wet brooms and sacks.

L. L. Crawford, chairman of the town of Riverton, October 8th:

September 20th a fire, caused by sparks from a railroad locomotive going east, burned over 450 acres of stubble and grass; destroyed 45 acres of wheat in stack, 45 acres of oats in stack, and 5 acres of oats in shock; damage, \$500 to \$600. It was extinguished by plowing and beating. There was a heavy wind.

Same, October 17th: In reply to your favor of the 13th, I will say that Mr. Evans has suffered from five fires besides the one that I sent you a regular report of, making in all six fires, all of which were set by N. P. engines. One on September 18th at 3 P. M., wind south, burned over 20 acres pasture, stubble and woodland, doing probably \$50 damage. September 19th, 11 A. M., 40 acres grass; probable loss \$10; south wind. September 21st, 3 P. M., 40 acres grass; loss \$10; south wind. September 27th, 1:30 P. M., 15 acres of grass, \$3.75. Same date, three acres of grass. I live about five miles south, and the country is hilly, and there is timber between where I live and where these fires occurred, so I could not see them. The weather has been dry nearly all of the fall. I understand that the railroad company has settled nearly all of the loss occasioned by these fires.

H. F. Burrill, chairman of the town of Hawley, October 18th:

On the 18th of September a prairie fire on section 8 burned over about 200 acres of prairie and field, and destroyed probably 20 tons of hay, 150 or more flax in stack; damage, \$275. It was extinguished by plowing to head it off; weather was windy. This fire was on the next day after the former fire reported by me, about one mile further west. I was somewhat in doubt as to the origin of this fire, but on inquiring of different ones, and of employes of the railroad company, and on the company making settlement, leaves no doubt who caused it.

#### KITTSOON COUNTY.

S. P. Almquist, of the town of Skane, April 20th:

The 11th instant a fire burned over 450 acres on section 25, destroyed about 6 tons of hay in stack; damage, about \$20. Weather very dry and windy.

Same, May 24th: On the 6th instant a field and prairie fire burned over about 25 acres of stubble and 100 acres of hay meadow; destroyed about 6 tons of hay in stack; damage, \$36 or \$40. It was caused by a party setting fire to some old grass. Weather dry and windy. The fire was extinguished by plowing and using wet sacks.

Tollef Skatrud, chairman of the town of Deerwood, May 12th:

On the 26th of April a prairie fire, which came from the town of Nelson Park, lying south of here, burned over 6,000 acres and destroyed lots of young poplar trees. Weather very dry. There was a hard wind from the south, and the sand and dust were so thick that I could not see the fire before towards evening. Twenty persons assisted in controlling the fire by back-firing, plowing, and using wet sacks.

Same, May 16th: A fire came into the southwest corner of this town May 5th, and was extinguished in five hours, after it had burned over 300 acres of prairie.

Same, May 27th: I have been to Nelson Park, but could not find any one who had seen how the fire had started. I learned that it started on section 3 in that town. It looked as if it had started near a road lying across that section. There is no settler near there. I have looked over the area burned, and the damage done is difficult to estimate, but I do not think it is very large.

Olof Dahlman, chairman of the town of Poppleton, June 27th:

The 2d of May a fire burned over 200 acres of brush and meadow, but did no damage. It extinguished itself by coming against a coulee.

Louis Melin, of the town of Poppleton, June 28th.

May 20th a prairie fire, caused by clearing land, burned over 2,000 acres of brush and meadow, but did no damage. It was extinguished by backfiring and whipping.

#### LAC QUI PARLE COUNTY.

E. O. Hertzberg, chairman of the town of Mehurin, April 9th:

On the 6th of April a prairie fire burned over 1,600 acres, but did no other damage but to burn old grass. The weather was dry and windy. I have not been able to ascertain the cause of the fire. I had four men to help control it. There was a fire in the southeast part of the town, and Fire Warden R. H. Lee had 14 men to help control it. He thinks it came from Garfield. There are fires all around us every day. I saw the chairman of the town of Manfred; he claimed the fire came in from Yellow Medicine county.

W. L. Taylor, chairman of the town of Manfred, April 20th:

Yours of the 15th instant is at hand. In reply would say, that the first fire to cross our town occurred on April 2d, coming from the town of Freeland, east of Manfred, which burned the grass of the north one-half of the township. No loss of property that I heard of. Second fire started on the farm of Gus Jensen, in Florida, Yellow Medicine county, April 7th. It was considered an accident, although a straw stack had been on fire for four days previous; a strong south wind fanned the embers and carried them to the prairie grass. Said fire crossed the railroad, went on to Rev. Maesden's farm, burned hay and large stock barn and 14 lambs. Thence across section 30 in Manfred, on into South Dakota, to the farm of Andrew Allen, burning his house and barn and one sheep. The house was large and new. There were ten children in the family. A subscription was started, and sixty odd dollars were raised for them. Said Jensen is a poor man.

Bastian Hanson, chairman of the town of Freeland, May 30th:

A prairie fire April 2d burned over 1,200 acres. It went through Mehurin and Garfield townships before it came into this town, and it did not do any damage in this town. Nothing was done to extinguish the fire in this town, as there was no damage to be done, on account of there being fields on three sides of the fire, so it went out by itself. There was hardly any wind.

D. P. Lister, chairman of the town of Lac qui Parle, May 14th:

I learned to-day that a fire occurred about two weeks ago, having started near the foot of Lac qui Parle lake, on the south side, and thence running



Scene in Aitkin County, near the north shore of Mille Lacs Lake, showing luxuriant growth in mixed woods. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



northwest for a distance of three miles, and burning a territory of about one-half mile wide, destroying some young timber and a few posts. Do not know who started the fire.

Same, May 19th: In view of the fact that the foot of the lake is frequented by parties fishing and hunting, who live away at a distance therefrom, it will be readily seen that such parties may easily escape detection. Also there is no one living within three-quarters of one mile from the place where the fire started, nor could any of the interested parties see the fire when started, while at their usual avocations at that time of the day. If the fire was started by party or parties who were non-residents, they could readily get away and all traces of them be lost, which I have reason to believe was the case in this instance.

P. P. Digre, chairman of the town of Garfield, November 10th:

On the 27th of October a fire on sections 29 and 30 burned over 300 acres, and destroyed hay of the value of \$100. It is claimed that it started from a threshing machine which passed by at the time. The fire was extinguished by plowing.

#### LINCOLN COUNTY.

Fred Joyut (justice of the peace), of the town of Shaokaton, April 13th:

On the 11th instant the wind was blowing a gale, when one Tees put out fire on his land, which in less than five minutes was beyond his control. The fire crossed the public road, in fact it went everywhere, as no force of men could have stayed it; threatened the haystacks of Fred Hatchard, who by great exertions, and with use of plows, saved the hay; then it struck the farm of William Jones, and only by heroic labor was his granary and 500 bushels of wheat saved, while his fine grove of several acres and hundreds of forest trees was completely burned over, and no doubt will die. Unfortunately, the offender is an old man and irresponsible in means, while the victim loses the work of 16 years, which he values at \$500.

Same, April 26th: The damage by fire can never be counted in dollars, as the grove was a fine one, and 16 years of labor and care are gone. Many posts are burned, fence prostrate, and yet the offender who acknowledges he put out the fire has not come near to offer to settle. On Sunday evening, the 24th, we had a violent storm of wind, and fires on the south line of our town which had been smouldering burst out, and for a time threatened great destruction. I have not yet learned of the damage done, but it is evident that drastic measures are necessary to insure obedience to the law and safety to life and property.

William Dorn, chairman of the town of Shaokaton, May 9th:

Yours of April 28th received. It took me two days to investigate the matter, as the witness you gave me would not testify that he had set the fire. I then went before a justice of the peace and made complaint, and the offender, Mr. Tees, came in open court and plead guilty, and the court fined him \$1 and costs.

## MARSHALL COUNTY.

O. L. Skonovd, chairman of the town of Comstock, April 28th:

Your letter received. Yes, there was a prairie fire here the 14th instant, and there have been prairie fires around here for more than three weeks besides, here is so much land that has not been settled. The damage the fire did the 14th was a hay stack worth about \$10; and the 24th of April a bridge was pretty nearly burned; damage, about \$50. There were seven men working there to get the fire out. I have been hunting for the fellow that set the prairie fire, but I cannot find any proof. I did not know that it was my duty to look after these fires before I received the circular from you. I did not get any instructions from the previous chairman.

Henry E. Turner, of Stephen, April 20th:

I would like to ask your advice in regard to the prairie fire. I have a tree claim on section 22, town 157, range 49. On this claim I had 10 acres of fine cotton trees and box elder trees, which were burned on the 18th of this month. I did not see the man set the fire myself, but another man saw two men working on the southwest quarter, and where he saw the fire start from. Besides the trees, there were two stacks of hay burned.

Same, May 9th: I got the chairman of my town and the other two men of the town board to look the matter up, and they found where the fire started from. The chairman of my town wants me to go and arrest the party that is supposed to have caused the fire, and he wants me to pay all the expenses, and he will not have anything to do with it. I do not believe in such a law. I should think it his place to arrest the parties and prosecute them himself.

Henry Roller, chairman of the town of Grand Plain, May 15th:

May 13th a fire burned over 400 acres (township 155-41), and did damage to the amount of \$100; it originated on the Indian reservation. The weather was very dry and quite windy. The fire was extinguished in five hours. Supervisor Johnson was present.

A. O. Bjurseth, chairman of the town of Spruce Valley, May 17th:

There have been several fires here this spring, but no damage done except one man lost his barn accidentally. The land here is mostly brush land or very small poplar groves; there is no large timber at all.

H. Amundson, chairman of the town of West Valley, November 15th:

A prairie fire occurred November 15th; it burned over 60 acres of brush. It was extinguished by me.

## MURRAY COUNTY.

Mikkell Bly, chairman of the town of Ellsborough, May 26th:

April 16th a fire burned over 640 acres of prairie in the south part of the town, but nothing was destroyed.

Same, November 2d: October 28th a fire burned over 160 acres on section 17, and destroyed 14 tons of hay belonging to Joseph Helland, and 20 tons belonging to W. Johnson; damage, \$70. It was caused by setting fire to a straw stack.

## NORMAN COUNTY.

C. M. Bell, chairman of the town of Hegne, November 5th:

A prairie fire November 3d burned over 1,240 acres of prairie hay land, and destroyed about 1,000 tons of hay, one barn, two stacks of grain, and did damage to the amount of \$2,500. It was caused by burning straw. One fire warden was present to help extinguish the fire.

William Oedor, chairman of the town of Good Hope, November 7th:

On the 5th instant a prairie fire which originated on section 21, being vacant land, burned over 3,060 acres, and destroyed about 100 tons of hay; damage, \$300. The weather was dry and a stiff northwest wind. The fire was extinguished by plowing and using such tools as came to hand.

## OTTER TAIL COUNTY.

William Zimmer, chairman of the town of Carlisle, September 23d:

On the 21st instant a fire, caused by sparks from a locomotive, burned over fifty acres and destroyed sixty tons of hay; damage, \$180. Six persons were called to help extinguish the fire, which was done by plowing around, but the wind was too high, and we had to use wet sacks to pound with, also scatter earth with spades. It was all we could do to save the owner's hay.

## POLK COUNTY.

L. J. O'Neill, chairman of the town of Chester, May 30th:

There have been at least a dozen small prairie fires set by the settlers to clear off hay land, etc., and so far I have not heard of any harm being done by fire in our town.

E. A. Engebretson, chairman of the town of Eden, June 2d:

In the first part of May a prairie fire burned over ten acres of meadow and destroyed about thirty rods of corduroy on the public highway; damage, \$10.

Charles Rigeimbal, chairman of the town of Crookston, June 27th:

A fire in April burned over twenty acres and destroyed a stack of hay; damage, \$30.

Ole P. Onstad, chairman of the town of Onstad, September 22d:

On the 20th instant a fire, caused by sparks from a locomotive of the east-bound freight train, burned over 100 acres, and destroyed 15 acres of flax which was cut and 75 shocks of oats; damage, \$200. It was extinguished by using wet gunny sacks. The wind was southeast.

Same, September 28th: The east-bound freight train which passed Holmes station about 11 o'clock A. M. yesterday, September 27th, set fire to prairie and burned over 1,900 acres of prairie, destroying houses, a school house,



grain, hay, fences, and in fact everything in its way; the wind was blowing at a terrible way from the south, and nothing could stop the fire. Our school house burned, and it caught in the shingles when the fire was six or eight rods off. The damage done will amount to at least \$2,000, if not more. I had my men put the fire out last night, working all day Tuesday and until 1 o'clock last night.

Same, October 1st: The damage done by the fire September 27th was \$3,000. The wind blew at the rate of fifty or sixty miles an hour, and nothing could be done. During the night we put it out on section 16. It burned north to the Great Northern track in town of Kertsonville. The weather had been dry for a long time, and high wind from the south.

Ole Olson, Jr., chairman of the town of Russia, January 27th, 1899:

On the 2d of November a fire originated on section 7, from section men on the Great Northern railroad burning the right of way, burned over 2,000 acres and destroyed hay and oats in the stack of the value of \$550. It went out five hours after it started by dampness of grass, in the evening the wind going down.

Michel St. Aubin, chairman of the town of Kertsonville, October 29th:

On the 27th of September, in the forenoon, a fire burned over 1,300 acres of prairie and stubble, destroyed one stack of hay and some shocks; damage, \$90. The weather was dry, with a high wind. The fire could not be controlled; it ran six miles in two hours.

Same, December 26th: When I made my report I did not know where the fire started, but Mr. Benoit, a fire warden, went to investigate the matter, and told me the fire started at the Northern Pacific railway; that the locomotive set the prairie on fire. It started three-quarters of a mile from Holmes station and ran from there to Kertsonville. It ran from the town of Onstad to Kertsonville town, and into Tilden town. The section men on the Northern Pacific railway told Mr. Benoit that the fire could not be controlled. It was too advanced when they saw it.

A. P. Moen, chairman of the town of Vineland, December 12th:

A prairie fire November 12th burned over 400 acres of meadow; did no damage. It was caused by parties burning around their hay stacks, and was extinguished in three hours by using wet sacks. There was quite a breeze from the west. I started as soon as I learned there was a fire, but it was extinguished before I reached there.

#### RED LAKE COUNTY.

Mangus Winberg, chairman of the town of Numedal, May 11th:

On the 8th instant, the weather being very dry and considerable wind, a fire burned over 1,000 acres of prairie, meadow and light timber; destroyed two stables and a granary, and forty acres of light timber; damage, \$100 to buildings and \$50 to the light timber. In the morning I saw the fire from my house, and I proceeded immediately to extinguish it, having the help of ten persons.

Joseph Pigeon, chairman of the town of Poplar River, May 14th:

On the 29th of April, a fire burned over 100 acres of meadow, and destroyed a stack of hay; damage, \$30.

Same, May 22d: The person who set the fire was prosecuted before a justice of the peace and paid a fine.

A. J. Hemstad, chairman of the town of Emardville, May 18th:

On the 14th instant, a fire, which originated on section 27, burned over about 200 acres of brush and light timber; damage, \$20. It was extinguished in twenty-four hours, by the help of seven persons. We saved several cords of wood, and we had to watch along the roads on all sides.

A. Beaushene, chairman of the town of Louisville, June 4th:

April 15th, a fire burned over 5000 acres of prairie and gravel; it did not do any damage. It was vacant land. Weather dry and windy. Three or four persons tried to control the fire, which was finally extinguished in the night by rain.

Same, June 22d: The fire, April the 15th, burned over 500 acres in the northwest part of the town, mostly meadow. It did very little damage, if any. Weather very windy. In the night came a rain, which extinguished the fire. These sloughs are burned over every year.

O. L. Larson, chairman of the town of Sanders, November 3d:

On the 2d instant, a fire burned over 300 acres of brush prairie, destroyed about eighteen tons of hay; damage, \$40. It was stopped against a road by backfiring. The wind was blowing hard from the southwest. Regarding the origin of the fire, there is strong circumstantial evidence, but no one saw the party set it.

Same, November 7th: The party setting the fire admits the fire started from his pipe while smoking, and then he could not stop it. He is willing to pay for the hay that burned up, and is sorry and in hard circumstances.

Charles P. Swanson, chairman of the town of Bray, January 10th, 1899:

On the 24th of April, a prairie fire in the south part of the town burned over about 200 acres, destroying nothing but grass. It was set by some unknown party in the evening of the day before in the adjoining town, the wind being south, and started of itself again in the forenoon of the 24th, weather being drier. It was extinguished in three hours by the neighbors who discovered it. I was confined to the bed during the time; was not able to be out.

#### REDWOOD COUNTY.

L. C. Burden, chairman of the town of Springdale, May 13th:

April 26th, a field fire burned over 80 acres; damage, \$200. It was caused by burning straw, and the wind was blowing a gale from the south.

Same, June 2d: I went and saw the man that set that fire. He admits setting it; said he was willing to pay all damages. He has put in the bridge, and paid the man for the hay he burned. He said it was an accident. I think he had a lesson that he will remember some time.

Howard Honner, chairman of the town of Honner, September 12th:

On the 3d instant, a fire, caused by sparks from a locomotive, burned over forty acres, destroying twelve tons of hay; damage, \$15. It was extinguished by a backfire, free use of shovels and wet sacks. Weather windy.

Theodore Daube, chairman of the town of Vail, December 13th:

On the 19th of September, a prairie fire, caused by burning stubble, burned over 160 acres, and destroyed a small bridge of the value of \$6. The weather was windy. Nothing was done except to save a couple of hay stacks, as the land was surrounded by roads.

#### ROSEAU COUNTY.

O. P. Gaukerud, chairman of the town of Jadis, May 18th:

No fire exists in this township that I can find out. Small patches have been burning this spring, but no damage done as far as I can learn. I have never been called upon to extinguish any fire. Yesterday the wind was from the south and a heavy smoke was lying over the country, and there must be a fire somewhere south in the swamps. This morning it has been raining for two hours; is raining still, so all fires, if any, will likely go out.

P. Skog, chairman of the town of Spruce, May 19th:

The spring has been dangerously dry. No damage to any account in this town, but in the neighboring territory east of here [unorganized] I think a large area of timber has been burned over. We have seen smoke and fire over there nearly every day many weeks.

#### STEVENS COUNTY.

Andrew Hardin, chairman of the town of Scott, September 17th:

The 17th instant, a fire, caused by burning a straw stack on section 7, burned over 800 acres, destroyed six stacks of wheat and two of oats and hay; damage, \$250. High southwest wind. The fire was extinguished in four hours by plowing and other means.

Same, October 12th: The weather was dry, and had been for several days.

A. A. Peck, chairman of the town of Hodges, September 23d:

On the 14th instant, a fire, caused by sparks from a locomotive, destroyed four acres of oats in the shock. Another fire the same day on section 29 burned two stacks of hay and burned over quite a large tract of stubble ground and wild sod.

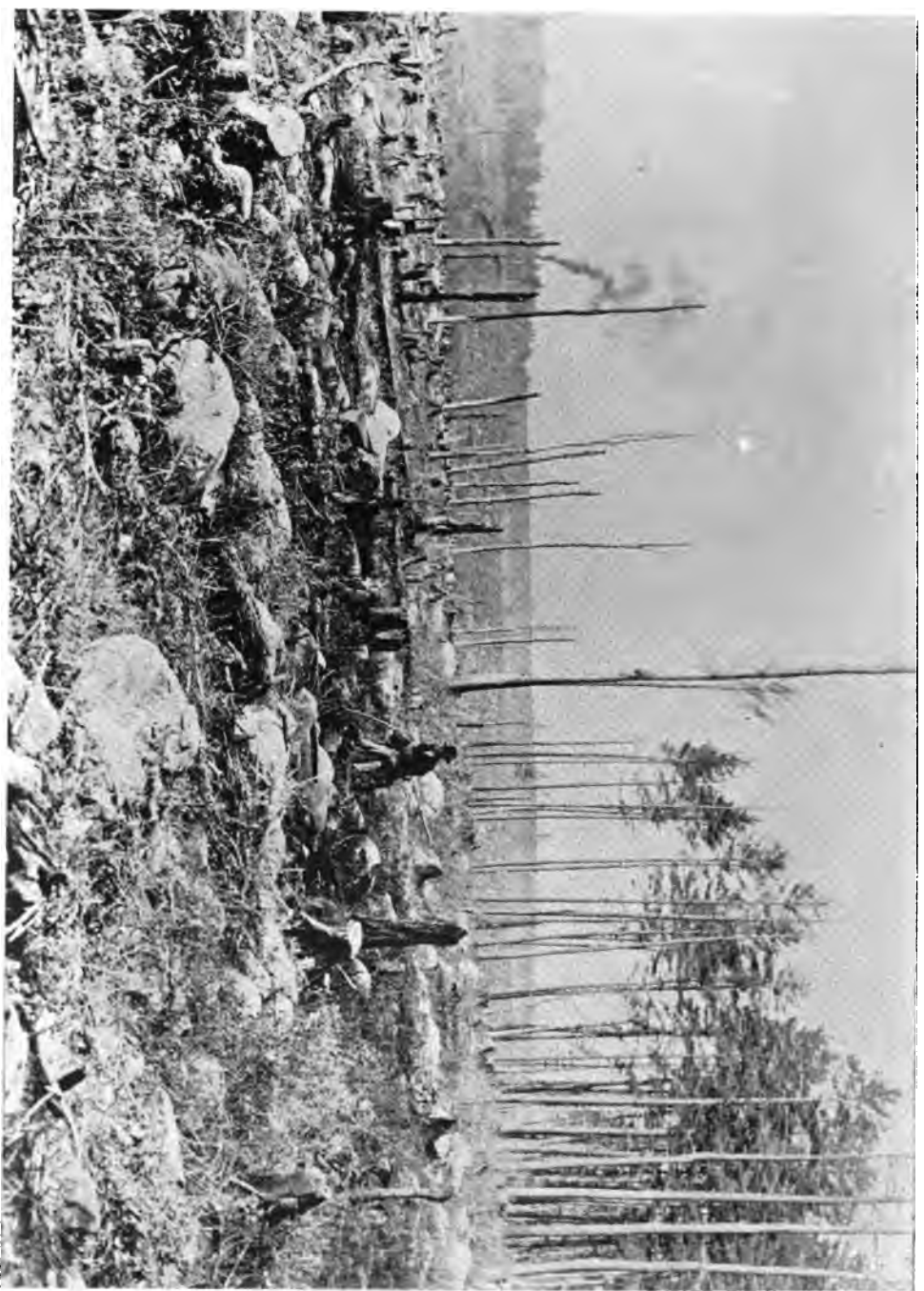
Carl Leaman, chairman of the town of Baker, November 29th:

A fire, on the 15th instant, burned over 300 acres of prairie, but did no damage whatever.

#### TODD COUNTY.

J. G. H. Brevet, chairman of the town of Ward, July 6th:

On the 12th of April, a fire, on sections 25 and 26, burned over about 600 acres of meadow; destroyed sixty tons of hay; damage, \$80. The weather was quite dry.



Non-agricultural land in St. Louis county from which a heavy body of white pine has been removed in the present way of lumbering without regard to reproduction. Such land is only fit for forest, and if properly used for forest would ...  
Photographed, 1898, for the Annual Report of the ...



## WILKIN COUNTY.

John A. Falla, chairman of the town of Akron, May 16th:

April 15th, a fire, which was set by an irresponsible person on section 17, burned over 640 acres; destroyed a bridge on the public highway; damage, \$15. The weather was dry and not very windy.

Stanislaus Bulik, fire warden of the town of Mitchell, June 27th:

A prairie fire, March 4th, which was set on section 12 from cause unknown, burned over 600 acres, but did no damage; it was put out with wet sacks.

Martial Beauden, chairman of the town of Roberts, October 8th:

On the 27th of September, a fire, which originated on section 15, being land occupied by Frank Marick, burned over 640 acres, and destroyed about twenty stacks of hay of the value of \$240. It was extinguished in four hours after it started by the work of seven men and five horses, with plows. The weather was very windy and dry, and had been very dry for several days. If the fire had not been extinguished it would have destroyed about 100 tons more of hay, and it is hard to tell where it would have stopped.

Hamilton Deal, chairman of the town of Nordick, November 8th:

September 3d, a fire, originating on section 3 from burning straw (land occupied by Frank Van Hook), burned over 20 acres of prairie. It was extinguished in four hours by the use of wet sacks. Strong wind from the west, but not very dry.

## YELLOW MEDICINE COUNTY.

Christen Olson, chairman of the town of Florida, April 2d:

March 30th, a fire in the southwest part of the town, which originated in the town of Fortier, burned over 1,280 acres; damage, \$125. It was extinguished in five hours, by the help of 10 persons.

Same, April 9th: On the 7th instant, a fire, which originated on section 20 from fire left in an old straw stack burned a few days before, burned over 1,500 acres; damage, \$400. It was extinguished in eleven hours by the use of wet rags and shovels, and by plowing. Weather very dry and windy.

Same, April 28th: On the 27th instant, a fire, which originated in South Dakota, came into our town on section 30, and burned over 620 acres of prairie and brush; damage, \$200.

Same, May 28th: Could not find evidence enough against the party causing the fire of April 7th strong enough for conviction. I can find plenty of complaint, but no evidence.

Same, September 29th: On the 28th instant, a fire on vacant land in section 23, caused by locomotive on freight train, burned over 350 acres, destroying prairie grass. Twelve persons assisted in extinguishing the fire. Weather dry and windy.

Elf O. Helgemoe, chairman of the town of Norman, May 13th:

May 5th, a fire, which came from the town west of this, burned over 350 acres, but did not do much damage. It was extinguished by six persons with wet rags and willow brooms. Weather dry, with northwest wind.

## INSTRUCTIONS TO FIRE WARDENS.

Under date of April 22d, three printed copies of the following circular were sent to each chairman of town board of supervisors in organized towns in the forest and prairie regions, blank for fire report and return stamped envelope; also one to each fire warden in unorganized territory:

C. C. ANDREWS,  
*Chief Fire Warden.*

R. C. DUNN (State Auditor),  
*Forest Commissioner.*

CIRCULAR }  
NO. 11. }

STATE OF MINNESOTA, }  
OFFICE OF CHIEF FIRE WARDEN, }  
St. Paul, Minn., April 22, 1898. }

*To Fire Wardens:*

We are entering upon the fourth year of the Fire Warden Law, and as a number of new Fire Wardens have been elected, it seems proper to call particular attention, in substance, to a few of the provisions of the law, namely:

Supervisors of towns are Fire Wardens.

Mayors of cities are Fire Wardens.

Presidents of village councils are Fire Wardens.

Fire Wardens shall post, or cause to be posted, warning placards.

Fire Wardens shall take precautions to prevent the setting of forest and prairie fires.

Fire Wardens shall enforce the provisions of the law.

This means that, among other things, they shall make complaint against parties who violate the law and endeavor to have them punished. Circumstantial evidence is sometimes sufficient to convict. A person who in very dangerous weather causes a fire which endangers the property of another is liable under section 9.

Chairmen shall inquire into the cause of each forest or prairie fire within their districts and shall report the same, etc.

This means that they shall make a prompt and thorough inquiry, and prompt report to the Chief Fire Warden.

The Chief Fire Warden has general charge of the Fire Warden force of the State; consequently his reasonable orders and instructions are to be obeyed with promptitude.

Any Fire Warden who refuses or neglects to perform his duties shall be deemed guilty of a misdemeanor and shall upon conviction thereof be punished by a fine of not more than \$100 or imprisonment in the county jail not to exceed three months.

District courts as well as justices of the peace have jurisdiction of offenses under the Fire Warden Law.

In case a Fire Warden is to be absent even for only half a day he should arrange to have someone act in his place.

Fire Wardens will please preserve this and other printed instructions which they may receive and turn the same over to their successors.

Respectfully,

C. C. ANDREWS,

*Chief Fire Warden.*

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### COMPENSATION FOR POSTING PLACARDS.

STATE OF MINNESOTA,  
OFFICE OF CHIEF FIRE WARDEN, }  
St. Paul, Minn., September 14, 1898.

*To County Commissioners:*

With a view to economy and uniformity of expense I would request that in auditing the accounts of Fire Wardens County Commissioners do not allow to exceed four dollars in all in any one township in any one year for posting the warning placards mentioned in section 4 of the Fire Warden Law of April 18, 1895. Where charge is made for posting placards the account should show the number of such placards posted.

Very respectfully,

C. C. ANDREWS,

*Chief Fire Warden.*

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### SOME OF THE COUNTRY IN BELTRAMI COUNTY.

Just after the middle of August I visited eleven wooded townships in Beltrami, one of Minnesota's three mammoth counties (it being my second trip into that county), where settlement has been greatly stimulated the past two years by the prospect of exceptionally favorable railway communication. Eleven townships have been organized the past year. The country is traversed by the newly extended Duluth, Superior & Western railway; and the Brainerd & Northern Minnesota railway then graded into it from Walker has since been completed to Bemidji; also,



the Great Northern has been extended into the county from Park Rapids. On the first of these routes the important lumber center of Cloquet is passed; also the town of Grand Rapids, capital of Itasca county, and whose court house and school house are among the handsomest in the state. West of Cloquet the route for quite a stretch along the bank of the broad and full St. Louis river is beautiful, and offsets several miles of swamp and dwarf spruce further on. But there are some areas that were ravaged by fire previous to 1895. From the village of Deer River to Bemidji the country is generally level. The railway runs in a straight line for about twenty miles. There are but few cuts and none very deep. For many miles west of Deer River tamarack forest predominates, yet there is some cedar and occasional belts of large-leaved, principally poplar timber. About all the ridges have a good growth of Norway and white pine, and there is a magnificent body of the latter near Cass lake. Between Deer River and Cass lake there is hardly a trace of fire.

From Cass lake west is gray or jack pine forest to a considerable distance beyond Bemidji. The country is well watered with clear lakes and streams. Some homestead farms have been opened on jack pine land and are reported as fairly productive. All of our Minnesota crops appear to yield well on soil that is well tilled. The vegetables grown around Bemidji are of a superior quality. There are natural hay meadows, but the livery man at Bemidji, who furnished me a team, said he paid \$40 a ton for hay last winter. This was because of the immigration and railroad building. In fir forest, on soil of sandy loam, I saw an abundance of the wild pea, which is eagerly eaten by cattle, and is regarded as evidence of fertility. Again amidst other shrubbery there will sometimes be seen an acre or more in extent, of the pink, two or three feet high, spear-headed flower called the great willow herb. Among the



Between Deer River and Cass Lake. Twenty miles of such country along the Great Northern (Fosston extension) Railroad. Scarcely any damage had, in August, 1898, been done by fire; and if fire is kept out the route will prove much more attractive for tourists. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



Appearance, August 14, 1898, of the site of the present village of Cass Lake. Engineer Alex. Stewart's office on left; Operator Hunter's office on right. Country covered with jack pine forest. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



most frequent plants in the hardwood forest are the life of man and the sarsaparilla.

The new, bright little two-year-old village of Bemidji, at the foot of the six-mile long and handsome lake of that name, is the capital and principal business center of Beltrami county; and while the surrounding country is generally level, there are on the west side of Bemidji lake, and again near Turtle lake, hills about two hundred feet high and covered with hardwood forest.

Although jack pine predominates in the neighborhood of Bemidji there are intervening areas of red or Norway and some white pine; also considerable bodies of mixed hardwood, which latter prevails where the surface is undulating. The whole shore of Bemidji lake is bordered with forest, and much of it hardwood—maple, white birch, oak, ash, elm, basswood, poplar, etc. Many settlers have taken charming homestead sites on the hardwood shores of lakes. I remember one in particular that I passed over at the north end of Lake Julia in the south part of township 149, range 33. The soil was black and rich and the timber largely white birch, with other varieties of hardwood, all standing close, tall and luxuriant, with here and there a handsome pine. Such land is easily worth \$25 an acre now. Some vacant homestead sites were pointed out to me in the vicinity of Buena Vista which desirable families could no doubt be guided to on application to responsible residents.

The jack pine, which is found only on sandy soil, seldom has any mixture of other trees, grows generally in close stand, having a uniform height of thirty to forty feet. It is valuable for shingles and fuel; some insist that it makes good lumber for finishing. I saw many extensive bodies of this timber which would net \$25 in value per acre. In a forest of pretty close-standing trees of this species, with stems free from branches, I saw jack pines a foot high

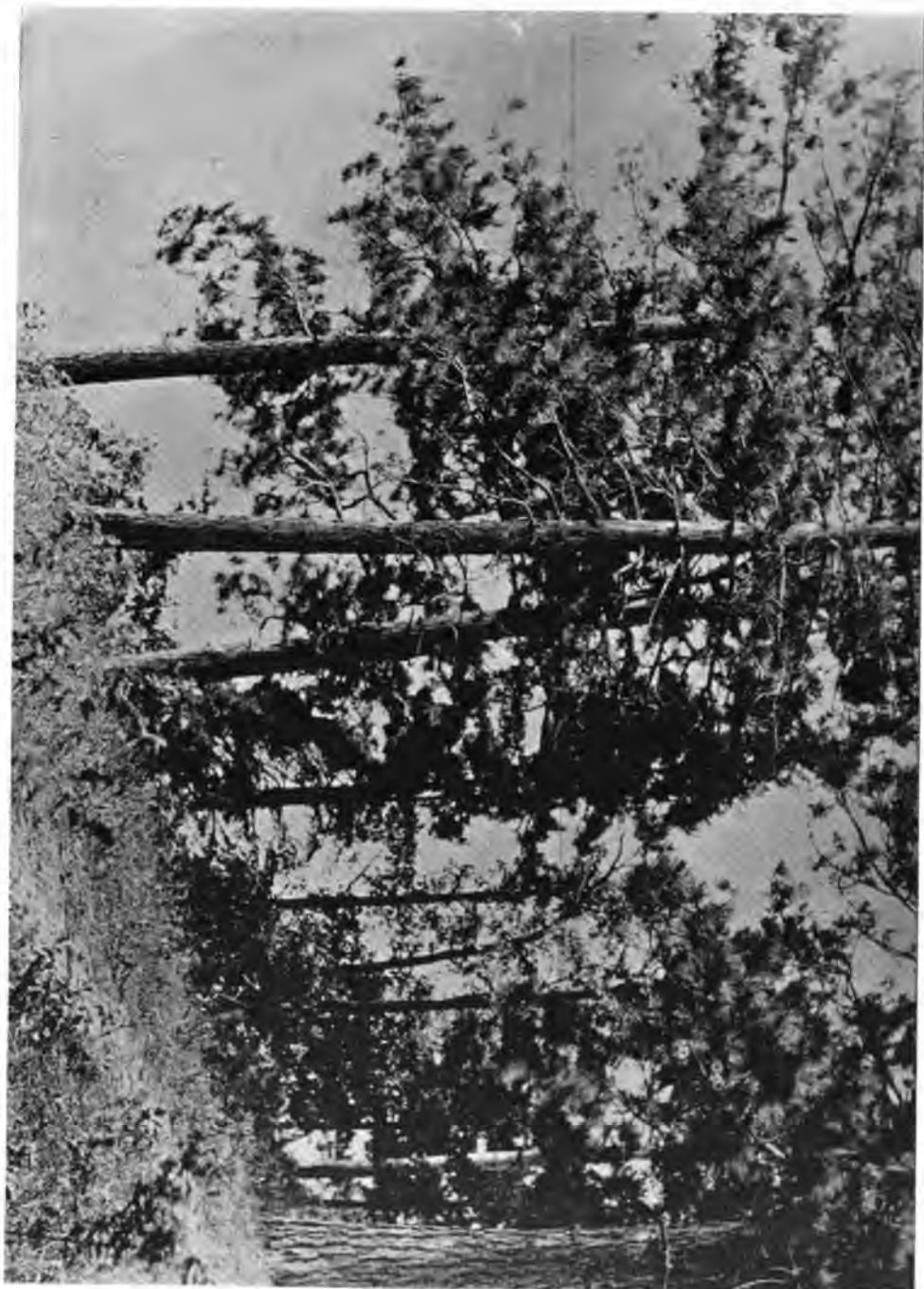
averaging 3,000 to the acre, which shows clearly enough how such pine will reproduce itself if fires are prevented.

Also in repeated instances I saw young Norway pine which had grown up so thickly as to almost cover the ground in presence of their full grown progenitors. I had the pleasure of seeing this on a school section of land, belonging to the state. I also saw considerable young white pine in white pine woods, but which of course, had not been scourged by fire. In these forests I was struck, as I often have been, by seeing lying on the ground numerous decayed trunks of trees of the same species which belonged to a former generation. Some of these decayed trees had been lying there nearly a century. While walking amid majestic living trees one actually walks over the graves of trees. Many of these remains have so shrunk by age as to be no higher than the little mounds in an old church yard. The presence in a pine forest of such remains, together with a young growth, as can be seen in so many instances by any one who cares to see, abundantly refutes the error which obtains to some extent that there is not a second growth of pine on the same land. Keep out the fires and the natural reproduction from seed will be perpetual.

In passing through some of the larger forests I was frequently struck by the absence of singing birds. The hawk is often seen, but the smaller birds hop about in silence.

There is nothing in the appearance of a white pine tree that could account for its name. It is called "white" because of the very light color of its wood. White pine is that clear, soft, but durable wood generally used for finishing, and which yields so readily to the knife. Standing in the forest, the bark of the full grown white pine has a pleasant slate color. Grown in the open, this or any other fir tree begins near the ground to send out branches, and in such situation does not make good timber; but in close stand in the forest, height growth is promoted, the limbs are shed, and at maturity it has a noble and beautiful shaft

View on the shore of Bemidji Lake, about three-quarters of a mile northwest of the village. Norway pines, Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.





free of branches for a distance of fifty or more feet from the ground. The white pine is the most valuable tree in the world and flourishes especially well in Minnesota. The red (or Norway) pine takes its name from the light red color of its bark.

The standing timber of all sorts which is exclusively the property of the state of Minnesota is estimated now to be worth \$10,000,000. Some of this, by rapid growth, increases in value at the rate of 7 per cent per annum. On an average its increase in value, if fires are kept out, will be  $3\frac{1}{2}$  per cent compound interest. In twenty years at this rate its value will have doubled and will then amount to the magnificent sum of \$20,000,000. Such a fact should impress every citizen of the great importance of protecting the forests, if only on account of the state's separate interest therein.

The estimate which I gave in 1895 of standing white pine in Beltrami County was 1,500,000,000 feet, board measure; of Norway pine, 350,000,000 feet. Several expert woodsmen have approved the estimate.

Mr. T. H. Croswell an experienced government surveyor has, at my request, furnished the following notes respecting the country in Beltrami county, north of Red Lake:

That part of the state which, roughly speaking, is bounded by Lake of the Woods on the north, Red Lake on the south, the Red Lake reservation boundary on the east and on the west reaches out to meet the prairies of the Red River valley, is the least touched by the hands of the whites and the last piece of ground to pass from the possession of the Indian. Here in a tract 40 miles wide and 70 in length there is even now no trace of civilization beyond the settlers' cabins on its various borders, save the surveyor's marks that mutely speak of the coming of a new race. Far away from the present lines of travel this stretch of country yet remains the haunt of the moose and caribou, while on the streams the beaver remain in sufficient numbers to maintain their dams and houses.

In general the land from its centre in Tp. 159, R. 35 W., slopes gently to the four points of the compass. Though level to the eye it descends with sufficient fall to give a strong current to the streams.



Possibly two-thirds of the land would now be classed as swamp, a large portion of the muskeg variety underlaid as a whole by a clay subsoil. Where the land rises above the level of the swamp there is a good soil, which will make valuable farms. The swamp lands hold water the whole year, and to become available will require large drainage operations. Directly north of Red Lake is one swamp some 12 miles by 25 which must be entirely drained. Much of the soil in the swamp when drained will be a mass of decayed wood and will be likely to burn up, lower the level of the land some two feet, but leave a land of considerable value. Cases occur in the swamps where in extremely dry seasons, tracts have burnt out and now appear as lakes some three or four feet deep. Along the creeks are some fine meadow lands, and as a whole the country offers fine opportunities for grazing purposes. This has been the first use the country has been put to along its western border, and in all probability will be the first use of the whole tract. The timber consists of spruce, cedar, tamarack, aspen, birch and pine; in the wet places, scrubby, and of no particular value. The first fires will entirely destroy it. The dry lands bear valuable spruce timber, trees reaching 3 feet in diameter and 100 feet in height. This is the most valuable and most extensive timber of the region. The tracts of pine have suffered as elsewhere great damage from fire, but there still remain a few isolated tracts of white and Norway pine. It is, however, safe to say, that at the present day on the entire ceded lands north of Red Lake there are not over forty million feet of these valuable trees.

Outcrops of rock are found in only two or three places and these may be merely extra large boulders.

#### STATE UNIVERSITY PINE LANDS—OPPORTUNITY FOR A DEMONSTRATION FOREST.

A golden opportunity is at hand for the State of Minnesota to raise its rank in science quite a little. It is a chance which the regents of the university have of setting apart an important area of pine timber land as a demonstration forest for use of the school of forestry connected with the agricultural college and experiment station. In general the university lands must be sold by the land commissioner (state auditor), as other lands which are granted to the state by the United States for educational purposes are sold; but there were certain salt spring lands belonging to the university which were left to the exclusive control of



A beautiful forest of virgin Norway pine belonging to the State University, on the north shore of Vermillion Lake. Where light has been admitted a natural and thick growth of young white pine has sprung up. An ideal picture of natural reproduction. Would make a fine demonstration forest for the School of Forestry. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



the regents of the university. Some of these salt spring lands a number of years ago were relinquished to settlers who had made improvements upon them, and in lieu thereof the United States secretary of the interior has lately certified to the state upward of three thousand acres of valuable pine lands, designated as university salt spring indemnity lands. This important acquisition was accomplished through the long continued, indefatigable efforts of Mr. W. P. Jewett, public land expert, as agent of the regents of the university. About 2,500 acres of the lands are in township 63, range 16, and lying mostly on the north shore of Vermillion lake, and about 1,000 are situated in township 61, range 14, all being in St. Louis county and distant only from ten to fifteen miles from the city of Tower.

Going from Tower on a steamboat I visited the most of these lands that are situated in township 63, range 16, in the latter part of September. Their surface is undulating; much of the soil is only a few inches deep, resting on granite or trap rock, sometimes in solid ledge, in some places in broken pieces, a soil favorable for forest growth, but unsuited for agriculture. There are areas of wholly white pine, of wholly Norway pine, the two mixed; and again both sorts mixed with hardwood. The pine trees vary from a foot to two feet and upward in diameter, and the more mature pines are about one hundred years old, and some are over one hundred feet in height. The pine will average all the way from 100,000 feet to 400,000 feet on forty acres. There is also much young pine, and the situation is favorable for protection against fire and theft.

If the pine on this land should be sold to the highest bidder and lumbered in the usual way the proceeds would amount to several thousand dollars; but if the timber should be cut clean, it would be liable to be burned over, the chances for reproduction of forest would be very poor, and, worse than all, the thin coat of soil over much of the area would be washed away and nothing left but a desert of

naked rock. If, on the other hand, it should be placed under the charge of the experiment station for the practice of the school of forestry it could in the end be made to yield a hundred-fold more revenue to the university. In such case the management of the land, briefly stated, would be this: The school of forestry, at the head of which is Professor Green, author of a valuable manual of forestry, would survey and map the land; clear such lands as are necessary for fire breaks; estimate and record the amount of timber on each subdivision; mark and count trees that ought to be cut in the first decade; take steps to have them sold at the best market; keep accurate accounts of sales and proceeds; make estimates of future yields; take care of the young growth; plant young trees where there is need of planting, in a word, to manage the forest on forestry principles so as to secure a sustained and perpetual revenue and in a way that all details could at any time stand the test of rigid inspection by any disinterested forest expert. In this way the students at the school of forestry, which forms a part of the university, would become proficient in the practice as well as the theory of forestry, and the State University of Minnesota would outrank all other universities, except Cornell, in this country in this important science, which is so rapidly coming to the front.

#### NEW LEGISLATION IN MINNESOTA ON FORESTRY—FOREST RESERVES.

The recent legislature of Minnesota took a forward step in forestry by enacting the so called Cross bill for forest reserves which is printed below. It was deemed good policy to have the bill introduced, as was done, in the same form except one or two verbal changes, in which it passed the House of Representatives two years ago after considerable discussion.

The main purpose of the act is to afford a way for the state to receive donations of cut over or other lands not

suited for agriculture and which may be used for growing timber. It is supposed that some owners of cut over land will give to the state, for forestry purposes, such tracts as are not likely soon to become saleable for farming purposes, rather than continue to pay taxes thereon. If the state should thus acquire land it is provided that two-thirds of the revenue therefrom shall be appropriated for public education (and to such public educational institution as the doner designates, in case he chooses to designate any institution) and one-third to the state for care and protection of forests, such third, however, to be divided so that the state shall retain one half and the town and county in which the land is situated shall each have one fourth in lieu of taxes on the land. The lands are to be known as "Forest Reserves" and their administration according to forestry principles is by a "Minnesota State Forestry Board" of nine members to serve without pay and to consist of the Chief Fire Warden, the Professor of Horticulture in the university, three persons to be selected by the regents of the university and a member each to be selected by the Forestry Association, the State Agricultural Society, the Minnesota Horticultural Society and the State Fish and Game Commission. The governor is to commission the persons so selected if he deems them competent. The Board may appoint a secretary and the state treasurer is to act as the treasurer of the board. The act carries an appropriation of one thousand (\$1,000) dollars annually.

There is a provision in a law of New Hampshire somewhat similar to the principle in this act. Section 4 of a law of New Hampshire March 29, 1893, creating a Forestry Commission, provides that "whenever any person or persons shall supply the necessary funds therefor, so that no cost or expense shall accrue to the state, the Forestry Commission is hereby authorized to buy any tract of land and devote the same to the purpose of a public park." Under this provision the State of New Hampshire has acquired some forest tracts in the White Mountains.

AN ACT TO ENCOURAGE THE GROWING AND PRESERVATION  
OF FORESTS, AND TO CREATE FOREST BOARDS AND FOREST  
RESERVES, AND TO APPROPRIATE MONEY THEREFOR.

*Be it Enacted by the Legislature of the State of Minnesota:*

SECTION 1. There is hereby designated forest reserves for the state, to be known and designated in all public documents as the "Forest Reserves," to be managed and controlled as herein provided, which shall consist of all such tracts and parcels of land as shall be set apart from any state lands, by the legislature, for forestry purposes; or which shall be deeded, devised, or granted to the state for forestry purposes, under the terms of this or any subsequent act, by any person or persons; or granted to this state by the United States government for forestry purposes, where such grants from the United States government have been accepted by the legislature of this state; or given or devised outright, for forestry purposes, to the state, by any person or persons.

SEC. 2. There is hereby created a forestry board for the state, to be known and designated in all public documents as the "Minnesota State Forestry Board," which shall consist of nine (9) members, to be designated or chosen as follows, to-wit:

1st. The person who by law is for the time the chief fire warden of the state shall be ex-officio a member thereof.

2d. The person for the time occupying the chair of horticulture in the agricultural department of the University of Minnesota shall be ex-officio a member thereof.

3d. Three (3) persons, citizens of the state, shall be recommended for appointment by the regents of the university in January, or as soon thereafter as possible, of every other odd-numbered year, commencing in eighteen hundred and ninety-nine (1899), for a term of four (4) years each, one of whom shall be selected on account of his interest in and knowledge of the planting, cultivation and preservation of forest trees and groves, in the prairie regions of the state; one of whom shall be selected on account of his interest in and knowledge of the best methods for the preservation of the natural forests of the state, and of reforesting denuded lands; and one of whom shall be selected on account of his interest in and knowledge of the best methods of protecting the sources of supply of the several river systems of the state.

4th. Four (4) citizens of the state shall be recommended for appointment as members of said board, as follows, viz.: One by each of the following named associations or bodies, for a term of two (2) years

each, in January, or as soon thereafter as possible, of each odd-numbered year, as follows, to-wit: The Minnesota State Forestry Association, the Board of Managers of the Minnesota State Agricultural Society, the Minnesota Horticultural Society and the State Fish and Game Commission.

5th. The recommendation for the appointment of such members shall be properly certified by the proper respective officers of such associations or bodies to the governor of the state, who, if he shall deem the persons so recommended suitable and proper persons therefor, may appoint and issue a commission to each of them; vacancies in membership shall be filled in the same manner.

SEC. 3. The board shall appoint a secretary of the board, who shall have charge of all books, maps, records, title deeds and papers, and documents of the board, and shall keep the minutes of all meetings of the board and executive committee, and shall prepare for printing and publication all bulletins, reports, circulars, rules, regulations, by-laws and other documents, ordered printed or published by the board. He shall cause to be made accurate maps of all tracts and parcels of the forest reserves, which maps shall be open to the inspection of any person desiring to inspect the same, but under such rules as the board may prescribe.

All such books, maps, records, title deeds and papers, and documents shall be kept in the office of the secretary, who shall also keep a record of the names and addresses of all beneficiaries under this act. The secretary shall keep a record of all warrants for the payment of money issued, and shall countersign each warrant which shall be signed by the president.

SEC. 4. No member of such board shall receive any pay for his services but shall be repaid actual reasonable expenses, incurred in attending meetings of the board or executive committee, or in performing services at the request of the board, or executive committee.

SEC. 5. The state treasurer is hereby required to act as the treasurer of the said board, and to keep accurate books of account of all money received and paid out for or on account of the said board or said "Forest Reserves," according to law and the by-laws of said board, and all funds appropriated for the use of the board, or which may in any way come to its use, disposal or control from the sale of timber or otherwise, shall be deposited with the said treasurer, and kept, and books and accounts of the same kept under the designated name of "Forest Reserve Fund," and there is hereby appropriated from any moneys in the state treasury not otherwise appropriated, the sum of one thousand (\$1,000) dollars, annually, to defray the reasonable, necessary expense of said "Forestry Board" in carrying out



the provisions of this act, which sum shall be credited to and be a part of said "Forest Reserve Fund." Said Forestry Board shall not be authorized to expend in any one (1) year any greater amount than the one thousand (\$1,000) dollars herein provided.

SEC. 6. The care, management and preservation of the Forest Reserves, and the forests thereon, as well as future growths thereon, and all moneys appropriated in that behalf, or collected therefrom in any way, and all personal property acquired to carry out the object of this act, are hereby confided to and vested in said Minnesota State Forestry Board, as the same may be herein, or in subsequent acts, defined and required.

The board shall observe, keep in view and so far as it can, ascertain the best methods of reforestation cut-over and denuded lands, foresting waste and other prairie lands, preventing destruction of forests by fire, the administering of forests on forestry principles, the encouragement of private owners in preserving and growing timber for commercial and manufacturing purposes, and the general conservation of the forest tracts around the head waters and on the watersheds of all the water courses of the state, and for these purposes to make reports of its doings, conclusions and recommendations to each session of the legislature, and from time to time publish, in a popular manner and print for popular distribution, in bulletin or other form, such of its conclusions and recommendations as may be of immediate public interest.

SEC. 7. The members of said board may choose a president and vice president annually, in January, or as soon thereafter as possible; may contract and be contracted with, in the name of the State of Minnesota, or in its behalf; adopt and use a seal, and alter the same at pleasure, and cause actions to be brought in the courts in the name of or in behalf of the state, to protect the state's interests in all matters confided to the board's care; a majority of the members shall constitute a quorum for the transaction of business and a less number may adjourn from time to time. The board may make all reasonable rules, regulations and by-laws for the government of its own meetings and actions, and for the conduct of its officers, agents and employes, and for the care, management, protection and preservation of the Forest Reserves and the forests thereon, and may appoint such needed agents, officers, attorneys and employes as it deems best.

The board may appoint an executive committee annually, on which it may confer authority to perform any executive act, and to exercise its judgment in minor details which cannot conveniently be acted upon by the board.

SEC. 8. The respective town boards of supervisors, and county commissioners are hereby constituted respectively, town and county

forest boards, which shall only have such pay for services, as shall be expressly authorized by the legislature, and which shall only perform such duties, have such authority, and exercise such powers, as may hereafter, herein, or in subsequent acts, amendatory or otherwise, be expressly conferred by the legislature.

SEC. 9. Any person or corporation being the owner in fee simple of any cut-over or denuded, or partially cut-over or partially denuded, natural forest lands, which will not probably be utilized for many years for agricultural purposes, or any bare or waste, or partially bare or waste, rough prairie lands, or any very sandy, very rough or very rocky lands, in this state, or any lands deemed absolutely necessary for the preservation of water courses (all to be determined by said state forestry board), may deed the same to the State of Minnesota for forestry purposes; all lands so deeded to the state for forestry purposes by any person or corporation are hereby forever dedicated for forestry purposes.

Before such deed shall be made and delivered, a proposition in writing shall be made by such owner or owners to said state forestry board to so deed the same for forestry purposes, under the terms of this act, and amendments thereof, made prior to such offer, and the question of the acceptance thereof shall be referred to the town or county forestry board where the land is situated (or both such town and county forestry boards) for its advice on the question of accepting the same; and said state forestry board, or its executive committee, may hear the person offering so to deed, or his or her representative, and also may hear such town or county forestry board or its representative, both sides in person or by written reasons submitted why such deed should or should not be received, and the decision of the state forestry board to receive or reject such offer and deed shall be final. Such deed may be made by quitclaim, when by the advice of the attorney general, or by the advice of its attorney, if said board have one, said lands are clear of liens except for taxes and tax sales still owned by the state.

When such deeds shall be so accepted by the board the lands thereby conveyed shall become a part of the Forest Reserves of the state.

SEC. 10. At least once in every five (5) years, and as much oftener as the state forestry board may decide, the accumulated income from each tract of land so deeded by the persons or corporations for state forestry purposes, shall be divided by the state forestry board and disposed of as follows, to-wit:

FIRST. One-third ( $\frac{1}{3}$ ) shall belong to the state, to reimburse the state for the care and protection of the forests thereon, and for the non-payment of taxes thereon to the state, county and town, which

third ( $\frac{1}{3}$ ) shall be divided between the state, county and town where the land is situated, as follows, to-wit:

One-half ( $\frac{1}{2}$ ) to the state, one-fourth ( $\frac{1}{4}$ ) to the county, and one fourth ( $\frac{1}{4}$ ) to the town.

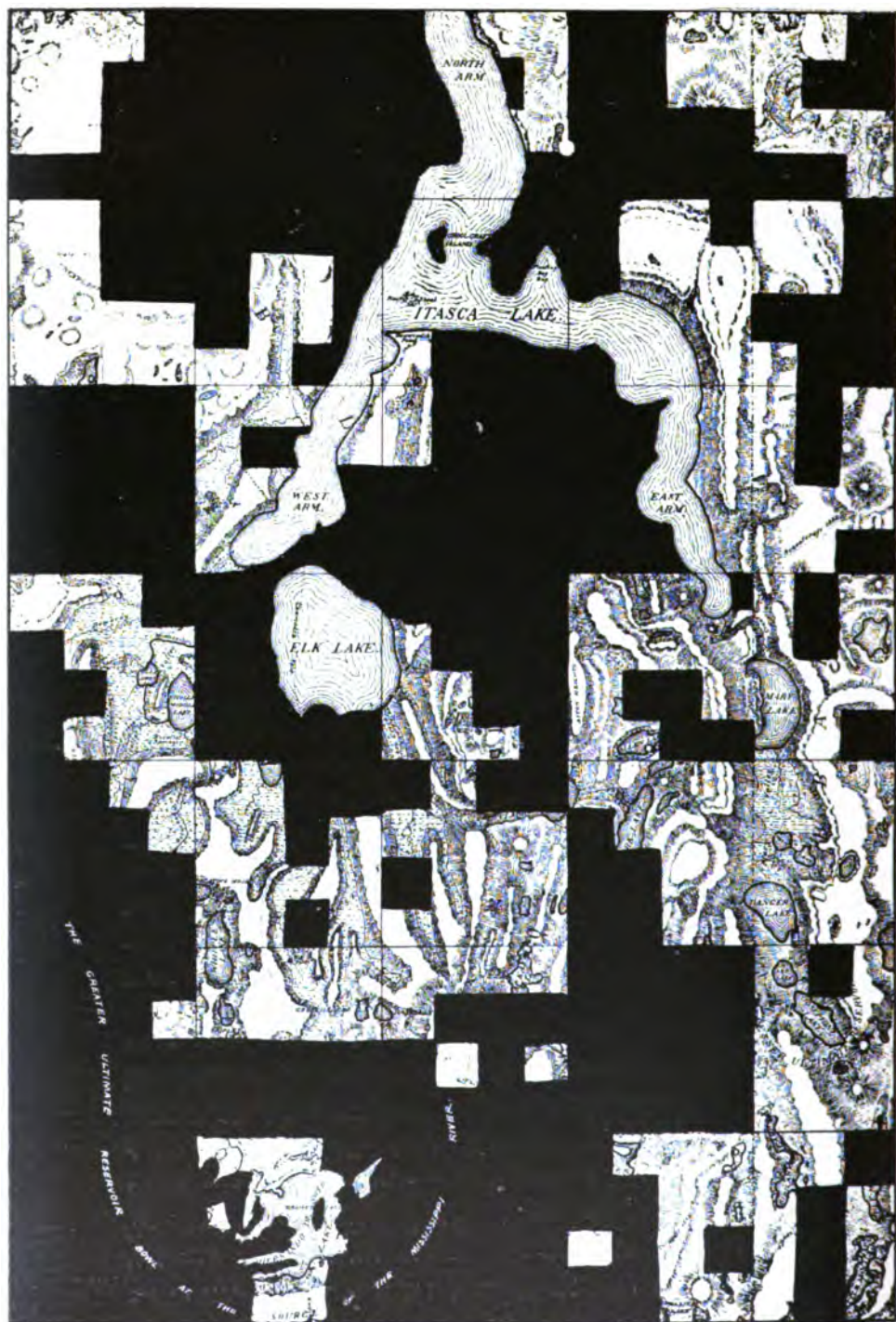
SECOND. Two-thirds ( $\frac{2}{3}$ ) shall be paid to such public educational institution or system in the state as the grantor may designate in the deed of conveyance, or in a separate instrument executed as deeds of land are required to be executed and recorded in the office of the register of deeds of the county where the land is situated, or by will. But in case the grantor fails to so designate such institution or system, or if for any reason such institution or system fails to exist, then the same to be paid to the proper officer or officers, or boards for the benefit of the public school system of the state and the university of Minnesota, the public school system to have three fourths ( $\frac{3}{4}$ ) thereof, and the said university to have one-fourth ( $\frac{1}{4}$ ) thereof.

SEC. 11. The state, by and through said state forestry board, shall have full power and authority to lease for revenue, or for protection from fire, trespassers, or otherwise, low meadow tracts, or other tracts for pasture, when the same will not interfere with the growth of forest trees, and to sell dead and down timber, and mature timber, and to deed said tracts or parcels or parts of the same, where the growth of towns, the building of railroads, water power or other public improvements may demand alienation by the state, and said state forestry board may cause to be cut and sold, or sold with the right to cut and haul away forests or trees when said board may determine that the state's and the beneficiaries' interests will be subserved by so doing, but all proceeds of such sales or leases shall be divided as is the income therefrom as above provided.

SEC. 12. This act shall take effect and be in force from and after its passage.

Approved April 13, 1899.





Map of Itasca State Park. Tracts in white owned by private parties. (By courtesy of St. Paul Globe).

## THE ITASCA STATE PARK.

In August I spent a day looking over the Itasca State Park in company with the superintendent, and walked several miles through thick primeval woods. I saw some handsome exclusively pine forest, also considerable forest of large leaved trees mixed with pine, balsam and spruce. Though not as rich in forest as some other localities in the State, it is yet well enough wooded to make a desirable park, aside from the interest attaching to it as containing the source of the Mississippi river. Evidently there is much wild game in its limits.

The only means of travel through the park at present is by boat. Its benefit to visitors would be very greatly promoted by the construction of paths and roads; and as soon as practicable the state should employ a landscape engineer to lay out and construct a system of roads and paths. Such improvements would add immensely to the attractiveness and value of the park. Towards this park Congress contributed as a gift 7,000 acres on condition that the State would protect the timber; and the only means for its protection from fire provided thus far, besides what the superintendent can do individually, is through the fire warden law. Another portion of the park, comprising 2,452 acres, was bought by the State of the Northern Pacific Railroad Company at fifty cents per acre.

The State is to be congratulated on the wise and fairly liberal action of the last legislature in appropriating \$20,000 to purchase timbered tracts within the boundaries of the park which still belong to private individuals and which, through lumbering, were liable soon to become denuded of forest cover and in a way to expose the rest of the park to serious danger from fires.

Chapter 303, of the General Laws of 1899, making the above mentioned \$20,000 appropriation, further provides that in case said appropriation shall become exhausted, and it shall transpire that timber is liable to be cut from any

land within the limits of the park, the attorney general shall endeavor to secure from the owner of such land an option to purchase the same, for a term not exceeding two years, which shall contain an agreement that the timber thereon shall remain undisturbed. He may pay for said option, if secured, a sum not exceeding four per centum per annum of such term, upon the value of said land as the same may be estimated by him. An appropriation of \$1,000 was made to enable him to secure such option.

#### CASS LAKE.

In my tour of inspection August last I took special pains to visit Cass lake, situated about two hundred miles northwest of Duluth, and found it to exceed my highest expectations in the beauty of its forest shores and availability for a health and pleasure resort. What attracted me particularly to Cass lake was hearing that the new Fosston extension railroad, running west from Duluth, as a part of the Great Northern system, passed through a very fine body of white pine near the lake; being the only considerable body of pure white pine adjacent to any railroad now left in the state except one in the eastern part of Carlton county, on the same road. I felt that it was desirable for the state to procure and hold as a park such a forest of white pine, near a railroad, while it was possible to do so. This body of white pine extends about two miles east and west by about a mile in breadth along the railroad near the south shore of Cass lake. Going straight north to Cass lake from the railroad the distance is not over a mile. Half a mile from the lake the forest changes from white to red (generally called Norway) pine in pure stand; that is, without mixture with any other sort of trees. The surface then begins and continues to slope very gently half a mile to the lake over an east and west extent of about two miles. (I am speaking now of the south shore, the only part I visited, but other parts of the shore are very fine.) The trees on the south shore have been growing about a hundred years, are tall



On the south shore of Cass Lake, looking west. Photographed, August, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.





and handsome, average a foot and a half in diameter breast high, and stand so thickly that a horse and buggy could not be driven through them. The soil is a sandy loam, the surface is free from underbrush and carpeted with pine needles. The clean, beautiful forest extends to within a step or two of the beach, which is of clean sand and just wide enough to be pleasant. There is not a weed or rush anywhere in sight. The water, which is remarkably pure, is shallow for a few hundred yards, making it an ideal place for bathing. The lake is ten miles long by eight miles wide, and contains two handsomely wooded islands, the larger of which is two miles across, and itself has a lake remarkable for its abundance of black bass. I have seen the most of the principal lakes in Minnesota, but have never yet seen any bordered with pine forest that could in any way match Cass lake for availability as a health and pleasure resort. Fir forest is especially healthy. Scientific men have ascertained that the air of such woods is richer in ozone than that of open country. Twenty-five per cent of the patients with incipient consumption who visit the Adirondack forests return cured. The state medical society should send a committee to visit Cass lake to report on its advantages and help mold public opinion so the legislature will make provision for the state buying a few thousand acres on the shore of the lake.<sup>1</sup> It all now belongs to the Chippewa Indians, and the government estimators of the timber now have their camps there in the midst of this beautiful south shore forest. They had dug a well, and I drank some of the water, which was cold and pure. These estimators were enthusiastic on the wonderful beauties of the place, and declared that it would be a shame to have the timber cut off. However, unless the state or the railroad company buys it to hold as a park, the timber land is liable to be sold in course of a year to lumbermen and the timber removed as soon thereafter as it suits the owner to cut it.

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<sup>1</sup> This was written in August last. A committee of the State Medical societies visited Cass and Leech lakes during the following autumn.

Under the treaty it can only be sold in forty-acre tracts and to the highest bidder.

The president of Dartmouth college estimates that 30,000 people visit New Hampshire every year, attracted by its scenery, and who leave in the state about \$6,000,000 a year. Minnesota has no White mountains, but this Cass lake, with its thickly standing, clean and magnificent border of pine, is one of nature's gems, which probably, take it all in all, cannot be matched anywhere in our whole country. To cut the timber would simply ruin it for scenery and health. The state should buy it and manage it as a place of resort and rest for teachers and others who need the recreation it affords. What is everybody's business is nobody's business; and I fear this will not be done, unless people with influence wake up to the importance of very prompt and energetic action. I repeat—and I cannot emphasize the matter too much—that it would be simply wicked for the people of Minnesota to allow the south shore of Cass lake to be denuded of its forest. He would be a true benefactor who would buy the tract and donate it to the state for park purposes.

#### REPORT OF THE MEDICAL COMMITTEE.

The following is the report made, December, 1898, by a committee of the State Medical societies, which visited Cass and Leech lakes, on the subject of establishing a health resort in the pine woods, and addressed to the executive and legislative committees of said societies:

Your special committee appointed to investigate and report as to the feasibility of a state sanitary resort in the pine regions of Northern Minnesota beg leave to report as follows :

That they have given the matter careful consideration, and find with profound regret that the acreage of primeval pine accessible to the centers of population is so rapidly diminishing that any effort to secure a large tract thereof must be prompt and immediate.

The growing popularity and success of such forest reserves as those of New York, New Hampshire and Ontario afford ample precedent for prompt action on the part of our young and enterprising commonwealth.



Part of a dense forest of white pine through which the Great Northern Railroad (Fosston extension) runs, just south of Cass Lake. Engineer's Camp. Photographed, August, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



Minnesota is peculiarly fortunate in having in the northern part of the state a most happy combination of sandy soil, pine timber and moderate elevation, thus affording ideal conditions for health resorts for the relief of consumptives, neurasthenics and all invalids in need of rest.

The efficiency or curative value of large tracts of coniferous forests in the cure of pulmonary affections has been fully demonstrated by the large percentage of cures in the Adirondack region and in the pine forests of Georgia. Such tract, if sufficiently extensive, could also be made available as a game preserve for such valuable game as are now native, but unfortunately being rapidly exterminated, or for such other game as might be introduced from time to time.

It could also be made the field of scientific forestry demonstration and an object lesson for future generations as well as the present one.

Your committee believes that now is the opportune time to secure such timber land, thus avoiding the large expenditure of money necessary later, the error of delay in the matter of expense being well exemplified in the greatly added cost of the Adirondack reserve.

Your committee, therefore, earnestly and unanimously recommends that the legislative committees of the state medical societies be requested to immediately call the attention of the governor-elect to this important subject in order that he may direct the attention of the legislature to the same. Your committee would also further suggest that the legislative committee consider this matter in detail at an early date and urge either state or national legislation, as may be deemed wisest, to secure the end in view.

H. H. KIMBALL, M. D.

PARKS RITCHIE, M. D.

THOMAS F. QUINBY, M. D.

W. S. LATON, M. D.

J. W. BELL, M. D.

E. L. MANN, M. D.

W. S. BRIGGS, M. D.

GEO. E. RICKER, M. D.

WILLIAM E. LEONARD, M. D.

Dated, Minneapolis, December, 1898.

#### UTILIZING OUR WASTE LANDS FOR FORESTRY PURPOSES.— DR. C. A. SCHENCK'S PLAN.

I do not expect that extensive forest planting will be soon undertaken in this state, but inasmuch as the imports of logs and lumber into the United States now average twenty-one million dollars a year in value, and considering

that it will take sixty to eighty years for a newly started forest on non-agricultural land to become merchantable timber, and bearing in mind that there is considerable of such land that has been forfeited to the state for taxes and yields no revenue but is deteriorating in value, it certainly does not seem premature to draw the attention of the public to the subject.

People make a great mistake who imagine that a forest is necessarily a vast inhospitable wilderness. The Black Forest (so called from the dark foliage of its coniferous trees) in Germany is 93 miles in length by 13 to 46 miles in breadth and abounds with villages and cities. It is traversed by railroads and good carriage roads. While there are solitudes on the high and rough land there are parts of it right in the midst of civilization. Writing of that portion of it near the city of Freudenstadt in Wurttemberg, Mr. Austin Cary, the well known Maine forester, says: "In five minutes' walk from the center of the city one could step into such fine woods as cannot be found in the whole state of Maine." So, if the project of planting or maintaining forest on some of the land in this state which is better adapted for timber production than field crops be undertaken, the people in the vicinity of such plantations need not fear that they will be shut out from the world. Any careful observer of land knows that in the same township will generally be found scattered areas of both good and poor soil. It is the object of forestry to utilize the poor soil; and when this is done one may expect to see in the same township villages, farms and forest. Besides, people living in the vicinity of well managed forests may count on having the benefit of good roads. They will also derive other benefits, because it has been well ascertained that the temperature of forests is a little cooler in summer and a little warmer in winter than that of open country. Forests are a barrier against hot winds from the south and cold winds from the north, they help to maintain water flow in streams, they enrich the soil on which they grow, they lend beauty to the land-

scape, and, being the basis of the lumber industry, they promote activity and wealth in the region where located.

There are in this state five million acres of vacant United States Government land. Including cut-over and other lands which, from being too hilly, too rocky, or too sandy are not available for agriculture, I assume that there are at least two million acres in scattered localities which are much better adapted for forestry than for agriculture. It is known that a large quantity of land—probably 200,000 acres—has been forfeited to the state for nonpayment of taxes. The most of such land may be supposed unfit for profitable agriculture. For the state to obtain absolute title thereto it would be only equitable that the state should pay to the towns and counties wherein it is situated any arrears of taxes due exclusively to such towns and counties. Such arrears would probably average twenty-five cents an acre. The inquiry arose in my mind how much richer our state would be at the end of sixty or eighty years from planting two million acres of this waste land to forest? I laid the matter before Dr. C. A. Schenck, superintendent of Mr. George W. Vanderbilt's forest at Biltmore, N. C., a very skilled and experienced forester (also assessor of forests of the Grand Duchy of Hesse-Darmstadt), and his valuable reply which I herewith submit shows that our state, by such an undertaking, would be seventy-two and a half million dollars richer! The total outlay would be \$42,400,000, including local taxes, and the net increase of wealth to the state at the end of eighty years would be thirty million dollars.

Dr. Schenck assumes that the land is to cost the state twenty-five cents an acre, and estimates that planting with pine on the large scale of 25,000 acres a year (which is less than is planted annually in Prussia), 5,000 plants per acre can be planted at \$11.25 per acre, to which add cost of land, 25 cents, makes \$11.50 per acre. This capital at two per cent compound interest will amount in eighty years to \$55.20. Meantime expenditures for taxes, protection and administration per acre will increase, at two per cent com-



pound interest, to \$9.70; which added to \$55.20 makes \$64.90 the cost of an acre of this forest at the end of eighty years. He estimates that the product per acre on average soil at the end of eighty years will be 12,000 feet, board measure, of the value of \$5.50 per thousand feet, equal to \$66 per acre, being equal to the capital invested, accumulated at two per cent compound interest. Continuously after eighty years the forest will yield annually on 25,000 acres a crop which can be cut of 12,000 feet board measure per acre, or 300,000,000 feet on the whole, worth at least \$1,650,000.

Dr. Schenck's statement is exceedingly clear and will be read with profit by every well wisher of our state.

#### SCHENCK'S PLAN FOR REFORESTATION OF WASTE LANDS IN MINNESOTA.

BILTMORE, N. C., Nov. 10, 1898.

GEN. C. C. ANDREWS,

*Chief Fire Warden, St. Paul, Minn.*

DEAR SIR : Pursuant to your request expressed on October 20th and reiterated on October 28th, I beg to submit to you statement of the possibilities of planting up large areas of otherwise abandoned and barren land in the state of Minnesota. I have assumed that an area of two million acres is to be planted up in the course of the next eighty years, and that waste land may be acquired for an amount corresponding to the arrears of taxes thereon due to counties and towns.

#### EXPECTED EXPENSE OF AFFORESTATION PER ACRE.

Strong white pine seedlings two years old, nursery grown, as will be well adapted for the reforestation in question, can be raised at a price not to exceed \$1.25 per thousand. If raised on a large scale it is not impossible that the price will be reduced to one-half of the figure given.

Cleft planting—which means planting in small holes made with a narrow and long spade—should cost not more than \$1.00 per thousand white pine seedlings two years old.

Five thousand plants per acre will be ample and will allow of a considerable death rate in early youth, as is sure to occur, and at the same time will allow the selection of the fittest individuals to take place from a large number of plants.

Assuming that the figures above given are correct, the reforestation will cost \$11.25 per acre, to which must be added the price of the

land, estimated to be 25 cents per acre, making a total of \$11.50 per acre.

Figuring at 2 per cent compound interest and discounting \$11.50 for eighty years, the figure \$55.20 is reached as representing the cost of the original plantation, with compound interest on it accumulated, at the age of eighty years.

In the meantime, taxes on the land, the cost of protection and administration, which will certainly not amount to more than 5 cents per acre per year, if planting is done on a large scale, will add up, again with compound interest of 2 per cent, to the figure \$9.70. Adding \$9.70 to the figure of \$55.20 just given as representing the final cost of the planting per acre, we reach the figure \$64.90.

If the yield per acre after the lapse of eighty years is as much as \$64.90, the planting will have paid 2 per cent of compound interest.

#### EXPECTED YIELD PER ACRE.

The white pine tables published by Messrs. Pinchot and Graves, in 1896, show that a plantation of white pine eighty years old is likely to yield the following amounts of lumber, if the trees are used up to a diameter of the logs not less than 8 inches :

On first quality of soil,	-	-	24,200 feet B. M. per acre.
On average quality of soil,	-	-	12,000 feet B. M. per acre.
On third quality of soil,	-	-	3,700 feet B. M. per acre.

Assuming that the two million acres to be planted up have a soil corresponding with Pinchot's and Graves' average quality, which I think is a safe supposition, and further assuming that the stumpage of white pine land thus raised is worth \$5.50 per thousand feet B. M., the expected yield is worth \$66 per acre.

I am confident that this price of stumpage and the amount of lumber per acre given are perfectly obtainable, to say the least. In other words, the expected yield per acre will be such as to certainly pay 2 per cent of compound interest on the original cost of planting, taxes, protection and administration, which should not be more than \$64.90 per acre as shown above.

#### VALUE OF THE ENTIRE INVESTMENT AFTER EIGHTY YEARS.

If a plantation eighty years old is worth \$66.00 per acre, then a plantation—

70 years old is worth, discounting it at 2 per cent,	-	-	\$54.12
60 years old is worth, discounting it at 2 per cent,	-	-	44.22
50 years old is worth, discounting it at 2 per cent,	-	-	36.30
40 years old is worth, discounting it at 2 per cent,	-	-	29.70
30 years old is worth, discounting it at 2 per cent,	-	-	24.42
20 years old is worth, discounting it at 2 per cent,	-	-	20.13
10 years old is worth, discounting it at 2 per cent,	-	-	16.50

If we plant for eighty years in every decade of years 250,000 acres, we shall have at the end of that period an area of two million acres covered with forest growth of different age classes—in fact of ideal arrangement of age classes, allowing the forester to cut 25,000 acres of mature timber annually thereafter.

The forest will consist of the following areas:

250,000 acres worth about \$66.00 per acre, making a total of 16.5 million dollars.

250,000 acres worth about \$54.00 per acre, making a total of 13.5 million dollars.

250,000 acres worth about \$44.00 per acre, making a total of 11.0 million dollars.

250,000 acres worth about \$36.00 per acre, making a total of 9.0 million dollars.

250,000 acres worth about \$30.00 per acre, making a total of 7.5 million dollars.

250,000 acres worth about \$24.00 per acre, making a total of 6.0 million dollars.

250,000 acres worth about \$20.00 per acre, making a total of 5.0 million dollars.

250,000 acres worth about \$16.00 per acre, making a total of 4.0 million dollars.

The entire area of two million acres will bear an aggregate value of stumpage amounting to 72½ million dollars.

#### AGGREGATE ANNUAL OUTLAY.

The expense for two million acres of land at 25 cents per acre will be \$500,000.

Annual expense for planting 25,000 acres at \$11.25 will be \$281,250.

Besides for taxes, protection and administration on an average area of one million acres—assuming that the two million acres will be acquired gradually—these expenses to be 5 cents per acre, must be spent annually \$50,000.

Thus, at an annual expense of say \$350,000 per year the state will own forest property worth 72½ million dollars after the lapse of eighty years.

#### RETURNS AFTER EIGHTY YEARS.

From the eightieth year on the forest will yield annually, on 25,000 acres, 12,000 feet B. M. per acre or 300,000,000 feet B. M. on the whole, worth at least \$1,650,000, figuring at a stumpage value of \$5.50.

It is very likely that a considerable yield from thinnings will be obtained at the same time. Under proper care, a second growth will be secured, in the place of the one planted, free of charge, from self-sown seed.

If the increase of lumber prices holds pace with the increase of population ( $1\frac{1}{2}$  per cent per annum) the result will be 3.3 times better than shown above. The investment will then yield  $3\frac{1}{2}$  per cent of annual interest instead of 2 per cent.

It is worth mentioning perhaps that the exclusive right of fishing and hunting on say 25,000-acre sections of the forest leased out periodically under certain restrictions will yield a considerable return as well.

To protect fish and game whilst protecting the forest will be an additional duty of the staff of forest rangers. The combination of forest rangers and game keepers is even from a financial standpoint a most desirable one.

#### SOME HINTS FOR THE PLANTER.

The planting, to begin with, should be made in a way safe-guarding the future forest against damage from fire, storms and insects. As large, even aged, forests suffer from these factors in a high degree, the reforestation should be made in strips, say 500 feet wide. The best soil should be planted up first so as to obtain early returns and so as to secure the necessary training of the crew of planters and of the superintendence of the rangers before more difficult tasks are begun on poorer soil.

The planting should proceed gradually toward the prevailing storm direction, so that after eighty years the plantations would lie about as follows :



The figures given in this sketch represent the age of the strip of forest. Every two series of such strips are separated by what may be called fire lanes.

Under this arrangement the storm will not blow down any trees.

Between every two strips, lines about 16 feet wide should be left unplanted as secondary fire lines. They should be kept cleared from inflammable matter as much as possible, so as to act as secondary fire lines and so as to facilitate supervision and transportation of forest produce. The main fire lanes, separating two series of forest plantations should be about 100 feet wide. They should be established at intervals of about 2,500 feet and should be kept absolutely clean from any inflammable matter, being burned over annually under proper supervision by the forest rangers.

This arrangement will necessitate each series of plantations to have a width of about 2,500 feet or to consist of about five strips each.

Adjoining strips should differ in age by at least five years and by not over twenty years, so as to avoid the spread of insect pests and fungus disease on one side and heavy overshadowing on the other side.

Seedlings and saplings of pine, tamarack, white cedar and hard woods, wherever they appear in groups sprung up from self-sown seed, should be fostered, whilst single individuals—especially misshaped and shrubby trees—should be gradually removed by deadening or otherwise.

A good survey must precede the entire operations. Without the help of accurate maps, forestry work is uncontrollable.

Only compact bodies of land should be acquired, the cost of protection and administration per acre being much smaller in this case.

#### HOW TO OBTAIN THE NECESSARY FUNDS.

The state will be entirely justified in securing the moneys necessary for the acquisition and the reforestation of land by public loans. Even part of the interest (certainly 2 per cent) due on such loans may be secured by loans. The increase of the loans, to be made annually, will go hand in hand with the growth and the extension of the forests.

The loans, backed by valuable assets, viz., the forests, will be obtainable at a comparatively low rate of interest. From the eightieth year on the net revenue from the forest is likely to yield sufficient interest on the entire investment.

From the sixtieth year on mature timber may be obtained from the best localities, yielding then (after Pinchot and Graves) 13,400 feet B. M. per acre. Inasmuch as the expense for acquisition and reforestation, administration and taxes is not made from loans, the forests will form the "Savings Box of the Commonwealth."



A very rich body of White Pine Forest, half a mile south of Cass Lake, Minn., along Duluth, Superior & Western R. R. Photographed for the Annual Report of the Chief Fire Warden of Minnesota, August, 1898.



Norway Pine Forest on south shore of Cass Lake. United States timber estimator's camp. Photographed, August, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



## ADVANTAGE OF THE STATE FOREST SYSTEM THUS SECURED.

The advantages of such a system of forestry are manifold.

*First:* All the sums spent for planting are money spent for common labor. The value of the plants too is nothing but money spent for gathering seeds, preparing nurseries, sowing seeds, weeding seed beds, etc., etc.—consequently nothing but money distributed amongst the laboring people.

*Second:* The common laborer engaged in forest planting finds work at the season at which labor is not required in agriculture, building, etc.

*Third:* The harvesting and the manufacturing of wood and lumber will be a source of revenue to a large population after another two generations, such revenue being derived from lands otherwise barren.

*Fourth:* The public loans above mentioned will offer a good chance for safe investments. History proves that investments in forestry are safer than any other.

*Fifth:* The fishing and hunting interests of the state will be greatly benefited by the forests systematically protected and used.

*Sixth:* The example given by the state will act as a stimulus relative to conservative use of forest resources by the wood owners.

*Seventh:* The counties will obtain taxes from land otherwise barren. Personally, I am strongly in favor of the state paying taxes on state forests to the counties and towns where such forests are situated. Of course these taxes should be taxes on the value of the soil *only*, just as in the case of agriculture, and not taxes on soil plus crop. This so much more as an immature crop has practically no market value and as revenue cannot be derived from it immediately.

For these reasons I have included taxes on the land amongst the expenses in the calculations at the head of this letter.

## POSSIBILITIES OF THE SPECULATION.

As regards the possibility of higher returns than those figured out to begin with, they may be expected with certainty.

A. If plenty of young healthy seedlings of valuable species are found growing on part of the area to be acquired. Every 1,000 seedlings thus found will save an expense of about \$2.25.

B. If part of the land is of so good a quality that less than 5,000 seedlings per acre will be deemed sufficient for the formation of a forest.

C. If cheap labor (children) can be used for part of the nursery work and for part of the planters' work. At Biltmore the clefts in which the roots of the seedlings are imbedded are made by men, whilst the plants are inserted into the clefts by boys. Even on steep



slopes and on clay soil, one man and one boy will plant 1,800 plants per day.

*D.* If the lumber prices and the facilities for transporting logs and lumber are increased in the course of the years. A change of conditions in that direction will also allow of a larger output of lumber, as logs having a diameter of less than 8 inches at the small end will be utilized to good advantage if the prices of logs and lumber are higher and if the freight charges are lower.

Under these circumstances the yield from thinnings will become valuable as well, especially on the better soil classes.

I consider the subject of reforesting waste lands in the state of Minnesota of paramount importance for the commonwealth for reasons which I need not explain to you.

I sincerely hope that your endeavors will be successful and it will give me great pleasure to give you any possible assistance.

Faithfully yours,

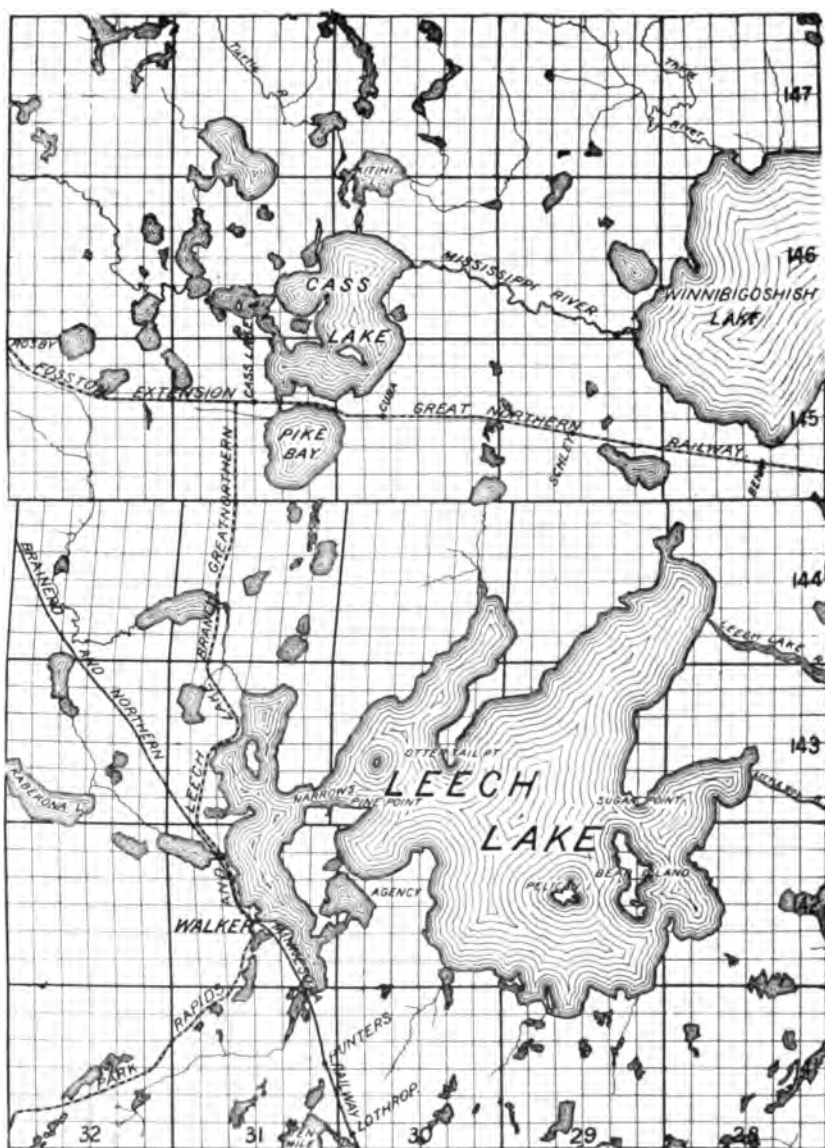
C. A. SCHENCK.

What is striking about this or any other plan of forestry is the remoteness of the profits. It is impressive, indeed, when people will sit down to calculate the returns that can accrue from the soil at the end of so long a period as eighty years! I would not exchange such a generation for one that went wild with schemes like Mississippi and Darien.

Of course there should be no haste in this matter; but it is the business of the statesman to study the wealth of nations; and one of the facts that may well arrest his attention is that whereas England and France together last year imported lumber and wood of the value of \$140 000,000, the United States were able to furnish but a small part of that amount, our total exports of lumber to all countries being but \$26,000,000; and if we continue to exhaust our forest capital as we are now doing, without any effort for forest reproduction, our ability to export lumber will yearly become less and less.

#### SOME FORESTRY FACTS AND PRINCIPLES.

The value of the pine, just as it stands, that is cut in Minnesota in a single winter, in a favorable business year, is \$5,000,000; when sawed into lumber at the mills, its value



MAP OF THE CASS AND LEECH LAKE REGION, MINN.



will have increased to \$10,000,000, of which increase 80 per cent, or \$4 000,000, represents labor; when further manufactured and worked up in various forms its value becomes multiplied. This partly illustrates the value of our forests as an industrial resource. The friends of forestry do not interfere with the cutting and marketing of timber. On the contrary, they wish the industry to be continuous, and a great step in making it continuous is the prevention of forest fires, thereby promoting the natural reproduction of forest on cut-over land. The friends of forestry concede that the private owners of pine land have a right to, and for their financial success must, cut and sell their pine whenever they can find a good market for it. If there are forest areas which the public needs to have kept as forest—for example, at the head waters of rivers to help maintain water flow, or near some beautiful lake for scenery and health—then the public must buy it. The private owners cannot be despoiled of it without remuneration. No! the friends of forestry do not interfere in any way with the rights of lumbermen and owners of timber land.

Many of the countries of Europe derive a good share of their prosperity from forestry. In Germany 1,000,000 people are supported by forestry, and 2,000,000 more by manufactures of which forest products form the principal material. The little Duchy of Baden, not as large as Pine county in this state, derives a net annual revenue of \$667,000 from its 240,000 acres of public forest. The Kingdom of Wurtemberg, only a very little larger than our county of St. Louis, derives a net annual revenue of \$1,700,000 from its 418,000 acres of public forest.

The Kingdom of Saxony—which leads all other countries in forestry—from its 430,000 acres of mostly spruce forest, and mostly on poor mountain land, derives an annual net income of \$1,900,000, being \$4.50 per acre. And she is not exhausting her forests. On the contrary, her forests are worth double to-day what they were forty years ago.

The forests of all these countries are not only profitable in a money sense, but they are provided with good roads, are well guarded, are delightful resorts, and not the slightest impediment to the settlement and cultivation of neighboring agricultural lands.

#### LEADING PRINCIPLES OF FORESTRY.

Some of the leading principles of forestry ought to be and easily can be understood by people generally. One of these principles is that the best agricultural land should not be devoted to forest; but that forest should be grown on land that is either too hilly, too rocky or too sandy and light for profitable agriculture. One of the great economic advantages—one of the great beauties so to speak—of forestry is that wood and timber can be profitably grown on soil that is unfit for farming purposes. The forest, by the leaves it sheds, continually enriches the soil; whereas, field crops exhaust it. Let this principle be remembered, that forest is not to appropriate good agricultural land. Wherever there is land now occupied by forest that is well suited to raise field crops it is expected that such land will finally be cleared and used for agriculture. It is, however, a fact, as has been shown by the experience of farmers in the older states, that much forest land is often cleared and put into field crops which is altogether too light and unfit for agriculture, but which, if left in forest, would continue to yield a good income. Farmers before clearing woodland should dig into and examine the soil. They should look ahead and remember that there is going to be a continually increasing demand for timber.

Another principle in forestry is that the forest must be continuous; that it should always furnish a sustained yield; that no more timber should be taken out of it in a year or in a series of ten or twenty years than grows in the entire forest the same period; so that in a hundred years hence as much can be cut in a year as can now be cut in a year.

The forest is to be treated as an inviolable capital and only the interest or income taken from it. Let us take this simple illustration: Suppose one owns 2,000 acres of pine forest which he wishes to maintain as a perpetual income-yielding forest property; he will, according to forest principles, cut on an average only 20 acres a year, taking the ripest and largest trees, and so as to promote reproduction on the cleared land by natural seeding from trees left standing. But if for a series of years the market for lumber is very favorable he may cut a good deal more than 20 acres per year; then, in a series of years of poor market, he probably will not cut any, but he will manage so that for a long period his cuttings will average 20 acres a year. At the end of 100 years' rotation the 2,000 acres will have been all cut, and whoever has the forest then will resume the cutting on the 20 acres that were first cut, and which by that time will have grown to large size. This explains briefly the method of maintaining continuous and regular forest revenue, which is the fundamental principle of forestry. It is well to notice here a great advantage which the forest crop has over the wheat or any other field crop. The latter must always be harvested and marketed when ripe, however poor the market may be, but a forest crop can be left continually growing till the market is favorable.

Another principle of forestry is that the cutting of timber should be in blocks or strips so as to facilitate reproduction of timber on the cleared areas by seeds falling from the trees left standing. This is a more economical way of reforesting than by artificial sowing or planting. Sometimes, however, there is need of artificial help in preparing the land for the seed or in planting or sowing here and there a patch to effect a sufficiently dense growth.

Another principle is that a forest when young must have, in numbers, vastly more trees than when it is mature. A tree grown in the open may be handsome and useful for shade, but it is useless for timber. To make good timber,

a forest, when young, must be crowded so as to secure height growth. In such situation there is a survival of the fittest. A struggle—a continual battle—goes on for supremacy, just about as in a human life. The weak ones succumb and perish; the strong ones tower aloft. In dense young forests the trees shed their branches or scarcely have any except near the top, and there is a lofty height growth of clear timber. A piece of mixed woods, managed on forestry principles in the Black Forest of Germany, has per acre at the age of 20 years, 3,960 trees; at the age of 40 years, 1,013 trees; at the age of 60 years, 449 trees; at the age of 80 years, 346 trees; at the age of 100 years, 262 trees. The decrease is sometimes partly effected by artificial thinning.

The fact is recognized that the most of the pine forest in Minnesota is now owned by private parties, who must, for their financial success, cut and sell their timber just as fast as they find a good market for it. In frequent cases they have built branch railroads into their forests, which they must take up as soon as the cutting and hauling are done. Hence they cut clean, even though some of the trees are not more than a third part grown. The practice is sometimes different in pineries bordering water courses, which afford a permanent cheap means of getting the logs to mill. In such pineries the proprietor can leave the younger trees to grow, and he can come back for them after an interval of some years. With the magnificent remnants of primeval pine the state has nothing to do except to aid in preventing its destruction by fires (and which in honor it is bound to do, since the pine land owners pay taxes for the protection of their property); or possibly the state should, before it is too late, buy and hold a few tracts of this virgin pine for parks.

Our best white pines have been growing from 100 to 300 years; and although merchantable pine, but not of the best quality, may be grown in 60 years, there are but very few individuals willing to wait so long for a crop; and if anything

important is to be done to renew and perpetuate our forest wealth, it must be done by the state, or through the inducement it offers through the reduction of taxes or in some other form.

It is more profitable to raise forest from natural seeding, but where land has been entirely cleared, forest of pine and spruce can be renewed only by artificial planting or sowing. There are in Minnesota several million acres of waste land unfit for agriculture, and now totally useless, but which might be made to yield a rich revenue to the state if planted with forest.

#### FORESTRY IN EUROPE.

Through the courtesy, hereby thankfully acknowledged, of the governments of Austria and Saxony, this office was furnished the past year with very valuable information in regard to the extent and management of forests in those countries. This, together with information procured from other European countries whose forest administration takes high rank, enables me now to give, by repeating some of the papers in my previous report, a more comprehensive, concise, practical and fresh account of European Forestry than has heretofore been published in this country. The list embraces in alphabetical order the following separate states:

Alsace-Lorraine.  
Austria.  
Baden.  
Bavaria.  
France.  
Hesse-Darmstadt.  
Norway.

Prussia.  
Sax-Meiningen.  
Saxony.  
Sax-Weimar.  
Sweden.  
Switzerland.  
Wurtemberg.



## ALSACE-LORRAINE.

## STATE FORESTS.

Aggregate extent 338,500 acres, situated in the valleys of the Rhine and Mosel Rivers and on the Vosges mountains. The prevailing kinds of trees are fir (*abies pectinata*), spruce (*picea excelsa*), pine (*pinus sylvestris*), oak and beech. The average estimated value per acre is about \$100. Annual aggregate expense of administration \$862,000; annual aggregate revenue \$1,712,000. Average net profit per acre, \$2.50. The number of acres annually sown with seeds, 610; planted with seedlings, 1,250 acres. On 2,750 acres the surface of the ground is roughly opened with spade, plow, harrow or hoe with a view to facilitate the germination of self sown seeds. On about 50 per cent. of the entire area, reforestation is effected by self sown seed, from standing trees; on about 35 per cent. of the entire area, planting trees and on about 15 per cent. planting seeds is resorted to.

There is a continuity of forest produce. The annual yield or cutting of the forest is not allowed to exceed the annual production. A decrease of the growing stock, by over cutting the forest, would be considered a criminal offense on the side of the forest administration. The general increase of the productiveness of the forest, however, permits of a gradually, but slightly, increased annual output. The forests consist of more or less averaged sections termed "compartments." Every compartment yields periodically (say in the 50th, 70th and 90th year of the tree life) a certain "intermediate yield," composed of immature trees, removed by way of thinnings. When the remaining trees reach financial maturity, they are removed either by a clean sweep or gradually, the removal proceeding hand in hand with the development of the second growth started underneath the mature trees (fir and beech).

The cutting of forests, with a view of using the soil for agriculture or pasture thereafter, is strictly prohibited since 1803, unless, under certain stated conditions, permission to the contrary effect is granted by the civil government. Any forest ground cleared from tree growth must be planted up within three years after such clearing, if in the opinion of the forest administration regeneration from self-sown seeds cannot be depended upon. The owner of unproductive lands, when proposing to plant such lands to forest, receives certain contributions out of the treasury of the state. Plantations made on the tops and on the steep slopes of mountains, also plantations made on dunes and on unproductive prairies densely clothed with ligneous weeds, are free from taxes for 30 years. The amount of damage annually caused by forest fires is very little; no data available. The principal cause of such fires, when they do occur, is the careless use of matches and cigars thrown away burning. Very few such fires are annually caused by railroad locomotives; no data available. It may be estimated that in Alsace-Lorraine, as in Prussia, 10 per cent. of all forest fires are caused by sparks from locomotives.

The forest service is entirely co-ordinate and equal to the other branches of the public service. The average salary per annum of the "Land Forst Meister" (forest councillor) is \$2,000; of the "Forst Meister" \$1,500; of the "Oberforster" (district manager) \$830; and the allowance for office and traveling expenses of each officer is \$500. All forest officers have the use of an unfurnished house free of charge. "Additions to the forestry statistics of Alsace-Lorraine" are published annually by the secretary for Alsace-Lorraine department of Finance, Agriculture and Government Lands. Twelve bulletins have been issued so far. Four periodicals bearing on forestry are published.

## PRIVATE FORESTS.

The aggregate extent of private forests is 771,000 acres ; of which 546,000 acres are managed on forestry principles, being owned by towns, villages or public institutions. The forests owned by private individuals proper, aggregating 225,000 acres, are managed at the will of the owner except as above stated. The average value per acre is uncertain ; it depends on growing stock, accessibility, quality of soil, etc. However, the average value of the private forests may be roughly estimated at 75 dollars per acre. The average annual rate of net income is between one and one-half and four per cent. The total forest product of Alsace-Lorraine is well sustained. The municipal forests yield 70 cubic feet per acre per annum. This quantity is equivalent to about 140 feet of lumber, board measure, and one half a cord of fuel. The population of Alsace-Lorraine is 1,605,000. The area of the entire territory is 3,625,000 acres, of which 1,110,950 acres are under forest. The annual yield of raw material is 61.1½ cubic feet per acre. Of this amount 40 per cent consists of timber, and 60 per cent of fuel, corresponding with about 170 feet timber, board measure, and four-tenths cord of fuel. The cost of cutting timber and fuel, inclusive of sawing into logs, piling along wood roads, etc., amounts to one and one-tenth cents per cubic foot. At this price, the workmen earn 43 cents per day. The value of timber, dragged to forest roads, is 9½ cents per cubic foot, on an average. The value of fuel, piled up along roads, is three and four-fifths cents per cubic foot, or about \$3.42 per cord. The stumpage of timber is worth about \$12.00 per 1,000 feet board measure. In the state forests about \$80,000 are spent annually for road improvement and forest railroads. The exclusive right of hunting is periodically leased to the highest bidder, under certain restrictions. These leases yield annually about 4 cents per acre. In the season of 1893-1894, for instance, there were killed



Remnant of the magnificent whitepine forest which covered an extensive area, including the site of the present town of Hibbing. Soil, red loam with some clay. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



in certain districts aggregating 320,000 acres 42 head of red deer, 451 head of roe deer, 175 head of wild boar, 2,555 hares and 24 capercalsey (mountain cock), besides a number of minor animals.

## AUSTRIA.

### STATE FORESTS.

The entire area under forest administration controlled by the Austrian state comprises 1,782,169 acres. The following table will show the several owners of the area thus controlled and managed by the state, giving at the same time under the different headings the use (forest, field, pasture, etc.) which is made of the area:

	AREA OWNED BY					
	State.	Roman Church.	Universities and Schools.	Charity Funds.	Greek Church.	Total area.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Forest .....	1,766,036	231,673	8,140	6,143	561,948	2,573,940
Fields, meadows, gardens .....	23,429	19,863	894	1,581	52,187	97,954
Alpine pasture land .....	143,220	17,471	2,090	114	50,398	213,293
Miscellaneous uses .....	33,899	885	34	25	133	34,946
Total of the productive area .....	1,966,554	269,892	11,158	7,863	664,666	2,920,133
Unproductive area .....	795,215	63,067	712	190	3,052	862,236
Grand Total .....	2,761,769	332,959	11,870	8,053	667,718	3,782,369

It appears from this tabular statement that the forests administered by the Government occupy an area of 2,573,940 acres, or 10.7 per cent of the entire forest area of Austria, being 23,993 442 acres. The Royal and Imperial Secretary of Agriculture at Vienna, under whom there is a

department of forestry for the administration of lands owned by the state, church, schools, etc., is entrusted with the administration of the entire area shown on the above statement with the exception of a few lots serving special purposes, which need not be mentioned here. Under the Department of Forestry there are eight territorial offices, and under these eight territorial offices there are 186 local offices. The largest area under the supervision of a single territorial officer is 628,225 acres; the smallest area under the supervision of a territorial officer is 191,498 acres, whilst the average is 452,762 acres.

Including unproductive soil a local range comprises in one case as much as 120,726 acres. If only the productive forest area is drawn into calculation, the maximum size of a local range is 58,993 acres, whilst the minimum is only 1,030 acres. The average size of the forest area under the management of a single local officer is 13,880 acres.

There are two distinct groups of forests administered by the state authorities—one in the east, comprising lands in Galizia and Bukowina, and one in the west, comprising the Alps. Besides, there are some smaller forests lying in the southern and the northern sections of the empire.

The eastern group is situated between the forty-seventh and fiftieth degrees of northern latitude and the forty-fourth and thirty-eighth degrees of eastern longitude (ferro); the western group is found between the forty-sixth and forty-eighth degrees of northern latitude, and between the twenty-eighth and thirty-fourth degrees of eastern longitude. The smaller forests in the north and south, just mentioned, reach the forty-third degree of latitude in the south and the fiftieth degree of latitude in the north.

The area owned by public institutions (church, universities, schools, charity funds), which hereafter will be termed "fund forests," are scattered between the forests owned by the state itself. Very often state forests and fund forests are allotted to the same local range. It is only in the

extreme east of the monarchy that there are found large areas consisting of fund forests only, namely, those belonging to the religious fund mentioned in the above statement in column 6 as "Greek Church," more properly called the "Greek Oriental Fund for Religious Purposes in the Bukowina."

All further details may be taken from the map. As regards the elevation at which the Austrian state and fund forests are found, it may be said that 2.6 per cent are lying below 300 meters (or 984.3 feet) elevation, 14.1 per cent between 300 meters (or 984.3 feet) and 600 meters (or 1,968.6 feet), 27.7 per cent between 600 meters (or 1,968.6 feet) and 1,000 meters (or 3,281 feet), 42.4 per cent between 1,000 meters (or 3,281 feet) and 1,500 meters (or 4,921.5 feet), and 13.2 per cent above 1,500 meters (or 4,921.5 feet). The main mountain range in the east consists of the Karpath stock, lying west of the Alps. It appears that the majority of the state and fund forests are found at an elevation exceeding 1,000 meters (or 3,281 feet), or at the headwaters of the streams. Hence they are of paramount influence on the climate and on the water supply of the adjacent territory.

It may be added that:

1. Twenty-six per cent of the state and fund forests are lying in the plains and at the foot hills.
2. Forty-nine per cent of them are lying in the mountains, at medium elevations, growing under conditions favorable to tree growth.
3. Twenty-five per cent of them are lying in the highest mountain region, extending up to the limit of tree growth.

The general topographical character of the Austrian state and fund forests is very variable, changing from the level plain to the very steepest declivities. The climate on the whole moderate. The quickest change of temperature takes place in the highest mountains and in the plains north of the Karpath mountains.



The annual mean temperature is highest in the forests of southern Dalmatia, between the forty-second and forty-third degrees of northern latitude, namely, 17.0 degrees celsius. Here the mean minimum temperature is minus 0.9 degrees celsius. The lowest mean annual temperature is found in the high mountains, at an elevation of 2,040 meters (or 6,693.24 feet), in the Alps of Kärnthen, namely, 0.6 degrees celsius. In this case the mean annual minimum is minus 21 degrees celsius. At an elevation of 1,600 meters (or 5,249.6 feet) above sea level, on the Schneekoppe, in the Riesen mountains, Bohemia, the mean annual temperature is 0.4 degrees celsius, the mean minimum being minus 33.7 degrees celsius. In the Alps the line of eternal snow lies above 2,700 meters (or 8,858.7 feet); in the Karpath mountains, above 2,460 meters (or 8,071.26 feet).

The precipitations are largest in the Alps, in the Bohemian mountains, in the Karpath mountains; smallest on the plateau of the Karst in Dalmatia and Istria. The average annual rainfall within the zone having rain during summer (in the central Alps) is 1,151 millimeters (or 45.315 inches); in the sub-Alps it is 1,008 millimeters (or 39.685 inches); in the northwestern part of the monarchy, 664 millimeters (or 26.142 inches); in the Karpath mountains, 732 millimeters (or 28.819 inches; in the zone of prevailing fall precipitations (i. e. in the territory adjoining the Mediterranean sea) the average annual rainfall amounts to 1,185 millimeters (or 46.654 inches).

The soil consists in the central Alps of crystalline slates joined towards north by a chain of silur and devon formation. On the southern margin of the Gneis mountains, and those consisting of syenite and granite, there is found red porphyry surrounded by red sandstone and dolomite. The northern Kalk Alps consist of shell and jura (limestone). The southern Kalk Alps show isolated sections of cretaceous formation. In the Karst mountains there are found

earlier calcareous formations, here and there interrupted by sandstone. The Hercynian mountains, in the north-west, consist of granite mixed with silicious slates dotted with a few basalt cones. The Karpath mountains contain a central range formed of transition rock, whilst their outskirts consist of sandstone, chalk and marlestone. The disintegration of the above named geological formations furnishes soil well adapted to forestry if the proper species is selected for the proper place.

The species covering most ground is the European spruce (*Picea excelsa*), occupying 49 per cent of the entire forest area. Beech is next, occupying 20 per cent. Then follows the fir, occupying 19 per cent, and the tamarack, occupying 5 per cent. A small area only is in possession of the pines (only 3 per cent). The balance of 4 per cent is occupied by alder, linden, maple, oaks, elms, aspens, willows, etc. It appears from these figures that the Austrian state and fund forests consist of coniferous woods to the amount of three-quarters and of hard woods to the amount of one-quarter.

In the Alps spruce reaches up to an elevation of 2,000 meters (or 6,562 feet), and in the Karpath mountains to an elevation of 1,500 meters (or 4,921.5 feet). It forms, especially on the high mountain ranges, pure forests in many cases. However, it is often found mixed with other conifers and with hard woods. In the very highest mountains it shows a poor growth, short boles and bad form, the diameter increasing rapidly from the root to the top. The branches are running down to the ground and are covered with lichens. Spruce thrives best on slightly sloping ground protected from high winds, where the underlying ground is a sandy loam formed from slate. Here the tree shows long, straight and clean boles. However spruce is found thriving in almost all situations.

Silver fir (*Abies pectinata* D. C.) is mostly found mingled with beech and horn-beam and spruce. It does not run as

high up in the mountains as the spruce will do. However, it is found in the Karpath mountains at an elevation of over 1,500 meters (or 4,921.5 feet). Pure forests of fir are found only in a few places (Vienna forest, Karpath mountains and Krain).

Larch (*Larix Europæa* D. C.) is scarcely ever found forming pure forests. Its favorite ground is an eastern and northern slope where spruce is the predominating species. Under these conditions it rises as high up as 2,200 meters (or 7,218.2 feet). Larch is thriving splendidly on calcareous and sandy loam, especially on well shaded slopes. Larch avoids wet, sunny, and such localities which are exposed to rough winds.

Scotch pine (*Pinus sylvestris* L.) is found in the Alps and in some dry and poor localities elsewhere. It is running up to an altitude as high as 1,200 meters (or 3,937.2 feet, in southern Tyrol even as high as 1,700 meters (or 5,577.7 feet), here attaining the size of a dwarf only. In the sandy plains of Galizia Scotch pine shows a good growth and furnishes fine timber.

The black pine (*Pinus Austriaca* Höss) is very scarce on the whole. On the south slopes of the Vienna mountains it forms small forests. It is fond of the sunny side and of calcareous ground.

Cambran pine (*Pinus Cembra* L.) is a tree of the high Alps. It thrives best between 1,500 meters (or 4,921.5 feet) and 1,800 meters (or 5,905.8 feet) elevation, rising up to 2,400 meters (or 7,874.4 feet). Its favorite stand seems to consist of a deep loam formed by the disintegration of slate. It is never found on calcareous ground.

Mountain pine (*Pinus Pumilio* H. K.), or dwarf pine, forms the uppermost fringe of the forests in the Alps.

The following species of pine are found besides the above named: *Pinus uncinata*, *Pinus halepensis*, *Pinus Pinea* L. The common juniper (*Juniperus communis* L.

and some other species of the same genus are found here and there.

Beech (*Fagus sylvatica* L.) occupies more ground than any other hard wood. It forms dense forests up to an elevation of 1,500 meters (or 4,291.5 feet), and at an elevation of 1,800 meters (or 5,905.8 feet) it still appears as a bush.

The oak (*Quercus*) occupies only 1½ per cent of the entire forest area. It forms pure forests here and there in the plains and in the foothill region. The following species of oak are found in the Austrian State and Fund forests: *Qu. pedunculata*, *Qu. Robur* W., *Q. Cerris* L., *Qu. pubescens* W., *Qu. ilex* L., *Qu. Suber* L., *Qu. coccifera* L., the four first-named species being more frequent than the three last-named ones.

The following shows the other hard woods found: Alders: *Alnus glutinosa* Grt., *A. incana* D. C., *A. viridis* D. C. Birches: *Betula alba* L. and *B. nana* L. Aspen: *Populus tremula* L., *P. nigra* L., *P. alba* L. Hornbeam: *Carpinus Betulus* L. Maples: *Acer pseudoplatanus*, *platanoides*, *campestre* L. Ash: *Fraxinus excelsior* L. Elms: *Ulmus campestris* L., *U. effusa* Wildenow and *U. suberosa* Koch. Linden: *Tilia grandifolia* L. and *T. parvifolia* Ehrhard. Besides, there are several species of *Sorbus* and of *Salix*.

It is impossible to ascertain the value per acre of the state and fund forests. This value depends on the locality, on the means of transportation, on the condition of the lumber market, etc. Even an average figure giving an idea of the value of the said forests cannot be given. If the annual net yield per acre is taken as a basis for the valuation of our forests at a rate of 3 per cent, then the average value of the state and fund forests per acre will amount to \$8.91. It is likely to range between \$3.50 and \$20 per acre, according to the possible yield.

From actual purchases and sales of state and fund forests, the following data may be taken, the sales taking place between the years 1800 and 1870: State forests, 2,060,232.6

acres were sold at \$22,192,749, or at an average of \$10.77 per acre; fund forests, there were sold 742,247 acres at a price of \$11,520,024, or at \$15.52 per acre on an average. The prices obtained for different portions of the forest, of course, were very variable. A sale of forest lands in Galizia, aggregating 285,733 acres, brought \$1,685,974, or \$5.90 per acre. Another sale of 80,209 acres, lying in Bohemia, netted \$3,259,480, or an average price per acre of \$40.64.

More recently there were purchased by the state and by the several public institutions owning fund forests: In the year 1887, in Kärnten, the domain Tarvis Föderaun, aggregating 32,569 acres, at a price of \$190,350, or at \$5.84 per acre. In the year 1889, in upper Austria, the domain of Weyer and of Reichraming, further two domains in Steiermark, holding altogether 108,254 acres, at a price of \$988,200, or \$9.13 per acre. In the year 1890 the domain of Nadworna (Galizia), aggregating 198,133 acres, for the consideration of \$919,350, or \$4.64 per acre. In the year 1895 the domain Veldes (Krain), consisting of 50,781 acres, for \$567,000, or at the price of \$11.17 per acre.

During the twenty years between 1874 and 1893 there was expended annually on an average:

I. For forestry proper, namely, forest utilization, transport of forest products, charcoal burning, maintenance of forestry buildings, silviculture, etc .....	\$732,578.17
II. For agriculture, namely, expenses for administration and for maintaining buildings.....	9,675.45
III. For other branches, namely, for technological industries, for shooting grounds, fishing, timber yards, etc .....	87,193 67
IV. For administration, including the salaries for all local officers, rangers, guards, etc., their traveling expenses, the expense of keeping up buildings used by these officers, etc.....	418,499.05
V. For public expenses (taxes and charity expenses) ...	259,867.44
VI. Money refunded .....	756.13
VII. Extraordinary expenses (purchase of real estate, new buildings, new surveys, demarkation of bound-	



Young and dense growth of jack pine about four miles west of Bemidji, on the road to Moose. Photographed, August, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



ary lines, forest working plans, prescriptive rights, etc.) .....	143,845.88
VIII. Administration at headquarters (expenses at the territorial offices and at the Ministry of Agriculture)..	151,340.20

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Grand total expense.....\$1,803,755.89

During the same period—namely, during the twenty years between 1874 and 1893—the mean annual gross receipts amounted to:

I. From forestry (sale of fuel and timber, of charcoal, of minor forest produce, etc.).. .....	\$1,727,805.73
II. From agriculture (rentals from land leased, etc.).....	161,592.16
III. Technological industries (rents of buildings and establishments, rents from shooting and fishing licenses, rents from yards, etc.).....	291,747.02
IV. Money refunded.....	6,524.15
V. Extraordinary revenue .....	19,492.24

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Total receipts.....\$2,207,161.30

To the latter figures there must be added the value of the prescriptive rights under which the inhabitants of certain villages have the privilege of taking timber, fuel, grass, etc., from the forest without refunding any money for such taking, estimated at..... 290,336.40

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Therefore grand total gross receipts .....\$2,497,497.70  
Deducting from this amount the expenses previously mentioned, there remains a net revenue of..... \$693,741.81

Thus the entire state and fund forests of the Austrian Empire have netted on an an average, during the above named period of twenty years, 26.8 cents per acre per year.

During the five years lying between 1887 and 1893 there were planted up annually on an average 15,614 acres, by means of planting seeds or planting seedlings, at an expense of \$28,586.01 for labor only. To these planting expenses there must be added the annual expenses incurred for the following items, namely:

I. For raising, transplanting and nursing plants in nurseries proper .....	\$17,894.78
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II. For preparatory work, as drainage, subsoiling, making mounds to plant upon, etc .....	1,694.96
III. For cleaning and attending to the young forest previous to the age of, say, 20 years .....	6,406.72
IV. Spades, picks, mattocks and other tools.....	834.02

Adding these items to the above named figure of \$28,586.01, the grand total expense for replanting amounts to \$55,416.49, or to \$3.55 per acre.

Of the entire forest area of 2,590,182 acres, six-tenths of one per cent are planted up annually. Of these 40.5 per cent were planted with seeds and 59.5 per cent were planted with seedling plants. For planting seeds there were used annually 23,669 kilograms of coniferous seeds; further, 561 hectoliters of acorns and 10,543 hectoliters of walnuts. The number of seedlings planted annually averages 17,604,196, planted out on 9,294 acres.

Regeneration is effected partly from self-sown seed under the cover of mother trees, partly from coppice shoots, partly by planting and sowing after clear cuttings as indicated above. Besides, where natural regeneration fails, planting seeds or seedlings takes place. The number of acres either wholly or partly cut over annually is 18,212. Of these, 55 per cent, or 10,108 acres, are planted up artificially by means of sowing and planting, whereas 45 per cent, or 8,104 acres, are regenerated from self-sown seed or from coppice shoots.

The difference between the area planted up annually, namely, 15,614 acres, with the area replanted annually after a clear cutting just mentioned, namely, 10,108 acres, amounts to 5,506 acres, and may be explained partly from the fact that on a considerable fraction of the 8,104 acres just mentioned artificial help is needed when natural regeneration fails, partly from afforestation of areas not occupied by forest crops heretofore.

The total amount of the annual harvest, or annual cut, on the whole area under state forest management is pretty constant, whilst it is more or less subject to changes in the

different territories or forest ranges, according to market conditions. Owing to the system of roads and railroads in the forest of Galizia and of the Bukowina being extended annually, the annual utilization of forest produce in the state and fund forests is expected to increase in the future. The annual cut depends on figures prescribed by forest-working plans. It is never allowed to surpass the yield capacity of the forest.

Aside from charcoal burning, forest products are sold before manufacturing takes place. The trees to be cut are felled, freed from branches, and cut up into logs, and, if so desired, split up and freed from bark at the expense of the owner of the forest. "Timber" consists of: (1) Timber fit for building purposes which is not cut up into logs; (2) saw logs, the length of which depends more on the conditions of the log than on inspection rules; (3) "work wood," which means timbers fit for carriage work, for turnery, etc.; (4) split timber, used especially for cooperage purposes. "Fuel" consists of wood for burning and wood for charcoal making. The former is cut up into pieces one meter (or 3.281 feet) long, the bark not being removed. According to the diameter of the log from which the fuel is taken, it is sold either split or unsplit. It is piled up according to quality, in distinct and separate piles. Fuel for charcoal burning is cut into pieces two to three meters long.

Relative to the reforestation of ground allotted to forestry, the main rules are found in paragraphs 2, 3 and 4 of the imperial "Patent," dated Dec. 3, 1852, which run as follows: Paragraph 2: "Without special permission, no forest ground must be devoted to other purposes than timber production. If forest ground is used for other purposes than timber production, the owner shall be fined 30 cents to \$1.50 per acre. After such unlawful use the ground must be replanted within a time prescribed by the local authorities. If reforestation does not take place within the

time thus prescribed a second punishment shall take place."

Paragraph 3: "Areas cleared from forests are to be planted up with timber species within five years after the clear cutting in the case of forests owned by the state or by the communities. Wherever there are clearings left from olden times they must be planted up within a period equal to the time fixed for the rotation of crops or fixed as the age of maturity of trees. In the case of private forests, a longer space may be allowed according to circumstances. Whosoever neglects this prescription shall be punished in the same way as if he had used forest ground for other purposes than for timber production." Paragraph 4: "No forest must be devastated; i. e., it must not be treated in such a way as might endanger or render impossible the continuation of timber production. If there is such danger, the fine to be imposed upon the owner of the land shall be the same as if forest ground was used for other purposes than timber production, or as if afforestation was omitted after a clear cutting. Aside from the fine, afforestation shall be made by force, if necessary, the owner bearing the expenses."

If the treatment was such as to render timber production impossible for the future, a fine up to \$3 per acre shall be imposed upon the owner. Under these rules or laws the local authorities have planted up during the years 1891 to 1895:

In state and fund forests, 231 acres; in communal forests, 28,269 acres; in private forests, 126,949 acres.

Preventives against forest devastation were taken:

In state and fund forests, on 1,393 acres; in communal forests, on 328,487 acres; in private forests, on 1,003,342 acres.

The statistics for the years 1891 to 1895 show that there occurred 3,007 forest fires, running over an area of 19,310 acres, and causing a loss of \$163,904. On the yearly aver-

age, 601 forest fires have run over an area of 3,862 acres, involving \$32,781 damage.

These fires were caused: By carelessness, in 1,210 cases; intentionally, in 181 cases; by sparks from locomotives, in 118 cases; by lightning, in 26 cases; by unknown agents, in 1,472 cases.

The officers of the state forest administration have a general rank equal to all technical branches of government administration. The forest officers in Austria are divided into two groups, one of which is attending to the administration of the Austrian state and fund forests, whilst the other is charged with the control and enforcement of all laws and rules enacted with reference to forestry. The latter forest officers are joined to the local political administration.

All government officers are allotted to different grades or ranks, the rank depending on their merit and their age, and being combined with a certain title and with a definite income peculiar to that rank. Forest officers are found in the following ranks: Tenth rank, forest assistants engaged in the administration of state and fund forests drawing a salary of \$364 to \$405 per annum, to which there must be added an additional pay varying from \$64 to \$162, according to the time which the officer has spent in government service; ninth rank, head foresters entrusted with the local administration drawing a salary of \$445 to \$526, with an additional pay varying from \$81 to \$202; eighth rank, a forest master, or inspecting officer, draws a salary of \$567 up to \$729 and an addition from \$97 to \$243; seventh rank, a forest counselor draws a salary of from \$810 to \$972 and an additional pay of from \$142 to \$283; sixth rank, a superior forest counselor draws a salary of from \$1,134 to \$1,458, in addition to a pay of from \$162 to \$324, depending on time of service. The traveling expenses, daily allowances on journeys, etc., differ according to the rank of the officer. Many of the local officers are living in government

buildings, paying a rent equal to one-half of the additional pay above mentioned.

Rules, instructions, laws, etc., are issued by the several branches of the forest administration whenever such enactments are necessary. Besides, the following printed matters are issued periodically or annually: 1. Report of the royal and imperial secretary of agriculture. 2. Statistical year book of the royal and imperial secretary of agriculture. 3. The year book of the administration of state and fund forests.

The prominent forestry periodicals published in Austria are: 1. The Austrian Forest and Hunting Paper (weekly). 2. "Central Blatt" of Forestry (monthly). 3. The Austrian Quarterly for Forestry, published every three months. Besides, the forest associations of the different sections of the empire publish material whenever they think it fit for the benefit of their members.

Germany seems to rank first among the European states as regards forestry, followed closely by Austria, having to deal with much more difficult conditions in the high mountains than Germany has to do anywhere. The system of roads and railroads is probably best developed in Austria. Forestry in France is taking high rank as well.

#### PRIVATE FORESTS.

At the close of 1895 the entire forest area of Austria was 23,993,442 acres. Deducting from this figure the area of the state and fund forests, aggregating 3,782,369 acres, there remain 20,211,072 acres, which are composed of communal forests to the extent of 3,456,782 acres, and private forests to the extent of 16,754,290 acres.

There are treated according to forestry principles proper: In the case of communal forests, 14.5 per cent, equal to 500,818 acres; in the case of private forests, 38.4 per cent, equal to 6,434,070 acres. In these forests all work is done

according to working plans, periodically made by officers of a training equal to that of the government forestry officers. In 85.6 per cent of the communal forests (2,955,964 acres) and in 61.6 per cent of the private forests (10,320,220 acres) no working plans exist. The work is done without reference to scientific forestry, more or less at haphazard after empirical rules.

The price of private forests depends on the quality of the soil, the age of the forest, and on the locality, viz., on the market conditions and on the industrial development of the section in which the forest is situated. Thus it is impossible to give even an approximately correct figure representing the value of private forests. Forest land has been sold actually at prices ranging between \$5 and \$340.

The annual net revenue drawn from forestry varies just as much as the value of the forest itself. It is impossible to give any exact figure showing the annual net revenue from private or communal forests. A net revenue of equal to two or three per cent of the capital invested in forestry may represent a fair average.

The annual production of timber and fuel in the Austrian forests has somewhat declined of late. Savings are made everywhere to make good former over-cutting. Besides, the regulations of the forest laws are now being enforced, and under these enforced laws the utilization of forest produce had to be diminished. In the year 1890 the total harvest of timber and fuel from 24,173,333 acres of forest aggregated 29,341,590 cubic meters, or 1,035,758,127 cubic feet. In the year 1895, on the other hand, there were cut from 23,993,442 acres only 27,523,241 cubic meters, or 971,570,407.3 cubic feet.

It may be stated that the smaller figures, representing the area of the forest in 1895, are explained by the fact that the political authorities, whenever they think it fit after consulting the foresters in charge, approve of a change of forest land into agricultural or pasture land. Besides, the

diminished area is partly explained by mistakes made formerly in the survey of the forests.

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## DUCHY OF BADEN.

### STATE FORESTS.

The aggregate extent of the state forests of Baden is 240,304 acres, located in the Black Forest and the upper valley of the Rhine. The prevailing kind of trees is coniferous. The beech, however, covers the largest surface; next follows the fir, then the silver fir and the Scotch fir. The average estimated value per acre, taking the average of the ten years 1886-1895, is \$98.55. The annual aggregate expense of administration is \$568,078. The annual aggregate revenue amounts to \$1,235,332, and the net revenue is \$667,244. Number of acres annually sown to forest is 222, and the number of acres planted is 823. Reforesting is effected by seed from standing trees; also by planting trees, in some rare cases by artificial sowing, the latter in the case of firs. There is a gradual increase of crop. The usual method of cutting the crop consists in cutting the mature trees and covers at periods, as a rule, from thirty to forty years, with longer or shorter intervals. Cutting in blocks clean (pines and Scotch firs) in exposed stormy situations is less frequent. According to paragraph 29 of the Forest Law of Baden of the year 1879, no part of any forest is allowed to be kept uncultivated. The number of forest fires during the years 1879-1888 was 61, the damaged surface 99 acres, and the damages amounted to \$2,225. The principal causes of such fires are negligence, when burning down the skirts of the forest, or by throwing away matches or stubs of cigars. Very few cases of fires are caused by railroad locomotives.

The forest service ranks equally with other branches of the public service, and is comprised in Class D of the tariff



Open country like what is often seen in the forest regions of Minnesota. This sketch is taken on the road approaching Turtle Lake, near Buena Vista, Beltrami County. In the distance is seen a clearing made about the year 1800 for Hudson's Bay trading post. Photographed, August, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



On head waters of the Mississippi. Bridge across the Little Mississippi, between Bemidji and Moose. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.





of salaries. Seven members of the Administration of Domains (which forms a part of the Treasury Department) are the highest forest officers. They bear the title of Councilors of the Forest Board, and have a salary not exceeding \$1,380 and \$147 compensation for rent.

Besides the state forest there are community and corporation forests, covering a total surface of 555,069 acres, which are managed on the same principles as the state forests.

#### PRIVATE FORESTS.

The aggregate extent of the private forests is 451,670 acres. About one-third of all private forests is managed on forestry principles, including the forests of the Public Administration of Street, River and Railway Construction, and the most extensive and important private proprietors. The total forest product of the country increases gradually.

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### BAVARIA.

#### STATE FORESTS.

Bavaria, whose attractive capital, Munich, is frequented by so many Americans, has 6,000,000 inhabitants. Its forests comprise 2,150,000 acres, of which 34.08 per cent are the property of the state. Large forests are to be found in all parts of the kingdom; but as a general rule the mountainous districts in the south (Alps), the north (Spessart) and northeast (Bohemian Forest) are covered with the densest forest. Of the whole area of the country 33 per cent is covered with forest. The prevailing kind of trees, or 77 per cent, are coniferous. The remainder comprise various kinds of deciduous trees—those losing their foliage in winter. Among the conifers red and white pine are most frequent. Among the deciduous trees the beech occupies the greatest space. The oak is also cultivated quite extensively for tanning purposes. The average estimated value of the

forest land is \$50 per acre. The annual aggregate expense of administering the forests (1891) including salaries of officials, wages of workingmen, local taxation, new purchases, etc., amounts to \$4,965,204. The total revenue from the forests the same year amounted to \$8,187,349. Number of acres sown or planted to forests in 1892 was 14,800, more than three-fourths of which area was planted with coniferous trees. In the case of the red pine and the white pine, reforestation is mainly done in the natural way. In the case of the fir (*Pinus sylvestris*) it is always effected artificially; in the case of the beech, always in a natural way (seed from standing trees); in the case of the oak, generally by artificial sowing. There is a continuity of forest products and a steady increase of the revenue which the state derives from its forests. This is due, first to an increase of prices, secondly to an increase of the yearly crop. The latter must chiefly be regarded as a result of the present condition of the forests, which are being and have been steadily improved; also of the economy which was practiced in former times. Where reforestation is effected by seeding from the standing trees, the crop is generally cut in lengthy strips, usually not exceeding about thirty yards in width. As a general rule the administration of the state forests makes it a principle to avoid cutting in large blocks clean. In regard to compulsory tree planting, it may be said that every forest area, the trees of which have been cut, no matter whether state or private property, must be reforested in a short time, unless evidence can be furnished that the land would be better adapted to agricultural purposes.

The damage caused by forest fires is quite insignificant, being in 1890 only \$974, in 1894 only \$1,686. The principal cause of such fires is the carelessness of the workingmen employed in the forests and of individuals and parties making excursions, particularly on Sundays. There are no data at hand as to the number of such fires caused by rail-

road locomotives, and although some fires are no doubt so caused, the number is certainly very small.

The administration of the Bavarian state forests constitutes one of the departments of the ministry of finance. It is directly subordinate and responsible to the latter, no other authorities intervening. The highest forest official who may be regarded as being at the head of the forest administration, responsible, of course, as stated, to the minister of finance, bears the title "Ministerialrath,"—ministerial or cabinet councillor. The chief director of the Bavarian administration of state forests is "Ministerialrath" Ganghofer. His starting salary is 7,740 marks. After a sixteen years' service the salary advances to 8,820 marks. Next in rank are the so-called "Oberforstrathe," with a starting salary of 6,660 marks, which, after a sixteen years' service, is increased to 7,740 marks.

There is no regular report published on the administration of the forests; however, the reports of the Royal Bavarian Bureau of Statistics, which are published four times a year, and the "Statistische Jahrbuch fur das Konigreich Bayern," which is issued annually since 1894, contains some data referring to Bavarian forestry. In addition budget reports on the administration of the state forests are submitted to the "Landtag" or Diet every second year.

#### PRIVATE FORESTS.

The aggregate extent of private forests was 3,149,400 acres in 1892. In addition to the state and private forests there are about 800,000 acres of forests belonging to separate towns and villages. The forests which are owned by great landholders are managed on forestry principles. These forests, however, only comprise a very limited area, somewhat less than 400,000 acres. Most of the private forests are the property of small landholders. The average value per acre of private forests is somewhat less than that of the state forests. The net income rate varies widely.

The data at hand are too few and too unreliable to admit of arriving at any conclusion with regard to the average. Opinions vary as to whether the total forest product of the country increases or decreases. In general the extent of the private forests seems to be somewhat decreasing. This would of course also appear to entail a decrease of the total forest product. Forest lands are only allowed to be changed into agricultural lands when proof can be furnished that the agricultural crop may be expected to exceed in value the forest crop. Between 1886 and 1891 7,000 to 8,000 acres of private forests were newly planted or sown.

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## FRANCE.

The total extent of the forests of France (exclusive of the colonies) is about 23,500,000 acres, which represents about 17 per cent of the surface of the entire territory.

These forests are divided in: Forests of the state, 2,700,000 acres; forests of the municipalities and of the public institutions, 4 700,000 acres; forests of individuals, 16,100,000 acres. The forests of the state and those of the municipalities and of the public institutions are managed and supervised by the Administration of Forests. France only extends over 9 degrees in latitude, but, as it has very high chains of mountains, the result is that it possesses all the climates of Europe, from the hottest to the coldest, and that a great variety exists in the species of trees that compose the forests.

The principal varieties of these species are: In the warm region, comprising the borders of the Mediterranean sea and of the Gulf of Gascony, the Cork Oak (*Quercus Suber*), the Evergreen Oak (*Quercus Ilex*), the Cluster Pine (*Pinus Pinaster*) and the Aleppo Pine (*Pinus Halepensis*).

In the temperate region, comprising the plains, the rolling grounds and the lower parts of the mountains, the common European Oak (*Quercus Ruber*), the European White Oak (*Quercus Pedunculata*), the Beech (*Fagus Sylvatica*), the Hornbeam (*Carpinus Betulus*), the common European Ash (*Fraxinus Excelsior*).

In the cold region, comprising the middle and upper parts of the mountains, up to the extreme limit of vegetation, the Pectinal Fir (*Abies Pectinata*), the Norway Spruce Fir (*Abies Excelsa*), the Beech (*Fagus Sylvatica*), the Scotch Pine (*Pinus Sylvestris*), the Mountain Pine (*Pinus Montana*), the Larch (*Larix Europea*).

It should be noted that the beech is found at the same time in the temperate and in the cold regions. The Scotch pine, which belongs to the cold region, has been artificially introduced on large areas in the temperate region.

#### STATE FORESTS.

The total area of the forests of the state, 2,700,000 acres, is composed of 2,100,000 acres of productive forests and of 600,000 acres of protective forests, situated in the mountains or on the dunes of the ocean; of lands recently purchased by the state on the banks of torrents and whereon timber is now being planted.

The forests yield annually to the state:

Timber (cubic feet) .....	33,800,000
Fire wood (cubic feet).....	62,300,000
Total .....	96,100,000

This represents nearly an annual production of 46 cubic feet of wood per acre of productive forest. The state forests produce in addition thereto oak bark, which is used in the tanning of leather; cork, rosin and several other small products; also hunting rights are leased.

The gross annual income in money is \$5,500,000, or \$2.62 per acre of producing forest. In some forests this average is largely exceeded and it attains as high as \$8 per acre.

The expenses are as follows, viz.:

Labor.....	\$1,240,000
Forest instruction.....	35,000
Sundry works.....	360,000
Reforestation of mountains .....	700,000
Taxes paid to departments and municipalities .....	360,000
Sundry expenses .....	60,000
Total.....	<u>\$2,755,000</u>

But of all these expenses a large share is applied either in administering the forests of the municipalities or in executing works of real public utility in the "protection forests," or in reforestation mountain lands (to prevent slides and the like). If we make these several deductions we find that the expenses incurred in the producing forests do not exceed \$1,500,000, or 71 cents per acre. The net annual income of these forests is therefore \$2.62 less 71 cents, equal to \$1 91 per acre.

The state forests are carried on either as high forest or as coppice, and are managed under regulations made by the President of the Republic. Cuttings are made yearly. In forests rich in wood there is cut every year an amount equal to the increment or growth; in forests poor in wood they cut less than the increment in order to gradually increase the forest. The endeavor is made also to increase the production of the timber wood by reducing that of the fire wood. The "high tree forests" are cut down at periods ranging from 120 to 150 years.

The work is directed in a way that will insure natural reforestation from the seeds that fall from the standing trees. Not only the trees that have attained the age determined by the rules are cut down, but also the dead ones and those which are dying and those that prevent the growth of neighboring trees. In temperate climate the annual cutting of high trees is on a limited area; a large number of trees are cut down simultaneously. In very cold climates and where winds are to be feared, only a few trees are taken away at

a time on the same point, and cutting is then done on a larger area.

The low forest, coppice and second growth are cut in rotations, ranging from 25 to 35 years. The reserved trees, which are very numerous, are cut on an average every 100 years, but some selected trees are allowed to attain and even pass 200 years.

The labor performed in the forests consists in the construction and maintenance of forest roads, water sawmills, houses for watchmen, replanting. Fortunately, owing to the system of culture now in use, artificial reforestation has but little importance in forests, properly speaking, but sowing and planting in the small open spaces, or on the points where a few more valuable species are to be introduced, or where the soil of the forest is better adapted to some varieties, there sowing and planting are more frequent. The average cost of such work is \$10 per acre.

Very considerable reforestation is made on mountain lands, where the state plants trees to regulate the action of the waters and stop the ravages of torrents. For that purpose \$700,000 are expended every year, the largest part of which is used in the purchase of land, and the other part in dams to regulate the streams, and in plantations to settle and retain the soil. The state purchases yearly on an average 16,000 acres. The average cost of reforestation is \$20 per acre, and \$18 must be added thereto for work in improving the streams, building roads, etc. Planting is preferred to sowing on calcareous or chalky soil.

The administration of the forests forms part of the Department of Agriculture. It has charge not only of the direction and care of the forests of the state and of those belonging to municipal corporations and public institutions, but also the overseeing of the fishing in the rivers and creeks. At its head is a director, residing in Paris, who has under him: A central service composed of 3 administering



general inspectors, 10 inspectors, 5 assistant inspectors and 17 clerks.

An exterior service composed of:

First—Personnel superior or of administration—32 forest keepers, 200 inspectors, 215 assistant inspectors, 250 general wardens.

Second—Personnel inferior or of surveillance—3,500 foremen and wardens, paid by the state; 3,700 foremen and wardens, paid by the municipal corporations and public institutions.

The annual salaries paid are as follows:

#### SUPERIOR OFFICIALS.

Director .....	\$3,000
Administrators .....	1,800 to 2,600
Forest keepers .....	1,600 to 2,400
Inspectors .....	800 to 1,200
Assistant inspectors.....	600 to 800
General wardens.....	300 to 520

Exclusive of some additional allowances for traveling expenses.

#### INFERIOR OFFICIALS.

Foremen and wardens paid by the state an average of.....	\$160.00
Foremen and wardens paid by the municipal corporations and public institutions.....	116.00

The foremen and wardens receive in addition thereto allowances of firewood, tillable land, pasture grounds, etc.

Those in the employment of the state have free rent in houses built in the forest, or in lieu thereof they receive as compensation a cash equivalent.

The superior officials are entitled to a retreat pension at the age of 60 years, and the inferior officials at the age of 55 years.

France has three forestry schools. One school of higher instruction at Nancy; one school of secondary instruction, and one school of primary instruction. The two latter schools are established in the department of Loiret, on the possessions of the administration at Barres.



Shore of Lake Itasca from where discovered by Schoolcraft, July 13, 1832. A fine body of Norway and white pine. Photographed, August, 18, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



Lake Itasca, looking south. Bear Paw point on left; Schoolcraft's island on right. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



## FORESTS OF MUNICIPAL CORPORATIONS AND OF PUBLIC INSTITUTIONS.

The forests of municipal corporations and of public institutions comprise 4,700,000 acres. They are supervised by the Forest Service on the same conditions and according to the same principles as the state forests. They contain about 200,000 acres of forests for protection, and their producing area is thereby reduced to 4,500,000 acres. They produce annually, timber, 42,000,000 cubic feet; fire wood, 128,000,000 cubic feet, and together, 170,000,000 cubic feet. This represents nearly an annual production in wood of 38 cubic feet per acre of productive forest. The annual cash value of the product, including the bark, cork and rosin, is \$6,400,000, or \$1.42 gross income per acre. The net income is about \$1.14 per acre. The forests belonging to the municipalities and public institutions are under regulations approved by the President of the Republic. These regulations and those of the state forests have been established with a view of insuring a continuous annual production and even of increasing that production in the forests where it is not yet sufficient.

## PRIVATE FORESTS.

Private individuals are at liberty to manage their forests as they please. But they are prohibited from cutting and taking trees from forests which are necessary to maintain and regulate water flow, to protect lands against the encroachments of the sea and sands, to defend the territory, or which are necessary for the public health. The destruction of private forests has become rarer and rarer and the proprietors acknowledge now that on soils of poor quality the income from forests is greater than that from arable land. As a result the area of private forests, instead of decreasing, increases from year to year by reason of the timbering of lands on which agriculture pays but small profits.

The income from private forests in quantity and in money is not exactly known. It is, however, known that on the same area they pay less than the state forests. Private individuals in their anxiety to get returns are inclined to cut down the wood when it is too young, and in the forests where coppice wood is raised they do not leave a sufficient reserve and oftentimes leave none at all. One can notice, however, that the principles of Sylviculture are spreading more and more in the culture of private forests. The large forests are subjected to the same mode of management and are treated like the state or municipal forests. On the whole the annual production is regular and tends to become better in both quantity and quality.

#### FOREST FIRES.

In the temperate and in the cold regions of France (that is, in the larger portion of the territory) the fires are but few and cause slight damage. The long periods of drought are not frequent, the numerous roads that run through the forests make very good lines of defense, and the villages that surround the massive wooded areas furnish at the first alarm devoted laborers. The railroad companies, being held responsible for damage by fire caused by flying sparks from their locomotives, take particular care, and in exposed places cut the grass and brush along their roadbeds.

The forestry code forbids, under penalty of \$4 to \$20, carrying or lighting matches in or within a distance of 200 metres from the forests.

In the forest camps of the state, municipal corporations or public institutions, it is forbidden to the workers to light fire outside of the buildings or shops, the location whereof is indicated by the forest service.

In the warm region the dangers from fires are greater. As a preventative against them more roads are built, trenches 20 to 50 metres wide and kept free from grass and brush are made around the forest, along railroad lines,

on the dividing lines between forests belonging to several owners, and also from distance to distance in the large and dense forests belonging to the same proprietor. The use of fire in forest camps and in agricultural camps situated within 200 meters from the forests is forbidden during the months of June, July, August and September. A special watch is organized, telegraphic lines penetrating the center of the forests admit of alarm of fire at its start and call for help. If the working force appears to be insufficient the military authority furnishes the deficiency and sends on the spot soldiers who act according to the directions of the forest service.

#### COLONIES.

France, fully convinced that the preservation of forests is in all lands of the highest importance, has organized a forest service in its possessions outside of Europe—in Algeria, Tunis, Madagascar, Indo-China, Reunion. In Algeria the organization is exactly similar to that of France, and calls for an annual expenditure for salaries and works of \$600,000.

The periodical on forests that has the largest circulation in France is the "Revue des Eaux et Forêts," issued twice a month. It is edited by "J. Rothschild, 13 rue des St. Peres, Paris." The price of a yearly subscription for foreign states is \$4. The Administration of Forests does not publish an annual report, but limits itself to furnishing to the public authorities the information that may be called for.

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#### HESSE-DARMSTADT.

##### STATE FORESTS.

The state forests of the Grand Duchy of Hesse-Darmstadt occupy 165,000 acres, and are situated in the Rhine valley (on alluvial sand), in the Vogelsberg mountains (on

basalt and red sandstone), and in the Odenwald mountains (on granite, syenite and red sandstone). The prevailing species are beech, occupying 40 per cent, scotch pine, occupying 34 per cent, and oak, occupying 16 per cent of the area under forest; whilst the remaining 10 per cent consist of spruce, fir, larch, alder and birch forest. It is a noteworthy fact, proved from the writings of Caesar, Tacitus and of early German authors, that there were no coniferous trees present in their time except Yero. Pine was introduced only from the 15th century on. The average value per acre is about \$100; but there are great differences according to quality of soil, transportation facilities and density of population. The annual aggregate expense of administration is \$148,500; and the annual aggregate revenue is \$561,000. There are planted annually to forest 750 acres, the planting extending over the entire surface of the ground. On 2,500 acres, according as "blanks" in natural regenerations are stocked, partial planting takes place. There are used on an average per annum: 110,000 pounds of seeds of broad leaved species; 4,000 pounds of seeds of coniferous species; 5,000,000 broad leaved seedlings; 5,000,000 coniferous seedlings. The annual expense for starting new generations of trees aggregates \$22,000. Beech is invariably raised from the seed dropping from mother trees evenly distributed. Scotch pine is planted when one year old, over 10,000 seedlings being used for each acre. Spruce and fir are planted when four years old, or seeds are sown in strips being about four feet apart. Oak is either planted as a seedling two feet to three feet high, or acorns are dibbed in, the method used depending on local conditions. All plants are raised in forest nurseries, kept under the care of local forest rangers. Comparatively large areas are covered with oak-coppice forest, which is copped every 15 to 20 years, with a view of obtaining tanning bark. White pine and douglas fir have been in-

troduced with splendid success. American red oak and hickory seem to answer the local conditions fairly well.

In certain densely populated sections, where soil fit for agriculture is scarce, field crops (potatoes and rye) are raised together with tree crops during the first three to five years following the cutting of mature trees. Rows of potatoes alternating with rows of pine seedlings are frequently seen. This combination reduces the expense of reforestation. It secures for the seedlings a soil of high porosity, whilst it exhausts, on the other hand, the mineral contents of the ground and the accumulated layer of humus.

Reforestation is effected on about 40 per cent of area by seed from standing trees; on about 10 per cent of area by coppicing and on about 50 per cent of area by artificial sowing and planting. The annual yield is strictly sustained. The yield per acre per annum is 74 cubic feet, of which not less than 60 cubic feet is used as fuel. The value of cordwood piled up along forest roads is about \$2.50 per cord. The value of logs cut and hauled to forest roads is about \$11.25 per 1,000 feet board measure. As to the usual method of cutting a crop, about 30 per cent of the yield is made up of stuff obtained from thinnings. The remaining 70 per cent consists of mature trees. Wherever regeneration is effected from self sown seed, the mature trees are gradually removed. Where planting is resorted to, a clean sweep is made of all mature trees over areas aggregating about 25 acres on an average. Large clearings are considered a mistake, as it is difficult to restock them.

With regard to compulsory reforestation the following may be said: Private forests must be planted up within three years after the removal of a mature crop. Exemptions from this rule may be granted, upon application, by the State Forestry Bureau. Waste land planted up by the owner is, once for all, exempted. If a forest owner hesitates to replant his clearings within three years after the cutting of the trees, he is subject to a fine. The forest authorities



will replant the clearing at the owner's expense, the owner being allowed the choice of species. Any treatment of forests likely to result in permanent unfitness for the production of timber, is prohibited.

Little damage is done, generally speaking, by forest fires. On the average annually 54 fires are reported, running over 45 acres altogether, and resulting in an annual loss of \$533. In 28 cases out of 272 cases the forests were so badly damaged that it was considered wise to cut the trees and replant the area thus cleared. The principal cause of forest fires is carelessness of smokers. A few only of such fires are annually caused by railroad locomotives, perhaps three annually.

The rank of the forest officer corresponds entirely with the rank of officials in other branches of the public service. The average salary per year of the "Oberforstrat" is \$1,300, of the "Oberforstmeister" \$1,125, of the "Oberforster" \$825, and the office and transportation expenses of the two last named are \$350 and \$200 respectively. No official report is published, either annually or periodically.

#### PRIVATE FORESTS.

The extent of private forests is as follows: Communal forests, administered by state foresters, 235,000 acres; entailed forests, owned by families, 132,000 acres; ordinary private forests, owned by individuals, 70,000 acres; total, 437,000. All communal forests and all entailed forests are managed on forestry principles, furnishing a sustained yield. The condition of the ordinary private forests is deteriorating, as the productiveness of the soil is abused by pasture, removal of litter and incomplete density of leaf canopy. Communal and entailed forests are worth as much as state forests, namely, about \$100 per acre. The value of private forests owned by individuals is considerably less. The average rate of net income is about  $2\frac{1}{2}$  per cent. The total product of the country is well sustained.

Considerable sums are derived in state and communal forests from hunting and fishing leases. The foresters of all grades enforce, *ex-officio*, all fish and game laws. The subaltern foresters, as a general rule, are taken from the army.

The wages of the common laborer average about 50 cents per day. In the mountainous sections wood fuel is cheaper than coal. In the state forests \$24,700 are annually spent for new roads, or for macadamizing old roads. The state oberforster is at the same time the manager of all municipal or village forests lying within his district. The sale of forest produce, however, is done by the mayors of towns and villages. A splendid system of well graded public roads, covered with stone in the Telford system and maintained at an annual expense of \$270 per mile, facilitates economic forestry to a very high degree.

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## NORWAY.

### STATE FORESTS.

The extent of the state and semi-public forests of Norway is 2,587,500 acres. Of these 837,500 acres are located in the provinces of Tromsø and Finmark; 140,000 in that of Norrland; 285,000 in North Drontheim, and 225,000 acres in South Drontheim and Romsdal, and about 397,500 acres in Hedemarken. The prevailing kind of trees are pine (*Pinus sylvestris* L.), spruce (*Abies excelsa* D. C.), and two species of birch. The average estimated value of the forest land is \$2.70 an acre. The annual aggregate expense of administration is about \$108,000, and the annual aggregate revenue varies from \$60,000 to \$67,500. The number of acres annually sown or planted to forest varies from 150 to 175 acres. Reforesting is almost entirely effected by natural seeding from standing trees, and, when artificial culture is employed, by planting trees. The crop of forest production

is periodical, and depends partly on the market prices of lumber. The forest administration tries to prevent the yearly average yield exceeding the net increase of the forest. Cutting must in part depend on the demand. Where it does not pay to cut smaller trees, the mature ones are principally cut, while at the same time, as far as possible, diseased and injured trees, as well as such as would hinder in the growth, are removed. Where, on the other hand, trees of smaller size can be profitably sold, small blocks are cut clean in order better to promote new growth.

The law of July 20, 1893, on the preservation of "Protecting Forests" and against the destruction of forests, has special provisions relating to "Protecting Forests," by which are meant forests serving as a protection against snow avalanches, stone slips, alteration of river beds, shifting sand, or as a special protection to other forests or to inhabited country. "Protecting Forests" are also such as bound districts and mountain forests, which, from their situation on the slopes of high mountains or in the neighborhood of the sea, or in the far north, grow so slow that they would die out if neglected. Under "Protecting Forest Lands" are also included bare fields, to be planted in the future to serve as other "protecting forests." The municipal council selects three men, who, after consulting the public forest officer, propose the localities within the district to be considered as "protecting forests." The municipal council has then to fix the boundaries of the forests, and on the proposition of the forest inspector of the district to determine the rules for its management. These regulations must have the sanction of the king to be valid. The municipal council can also make reservations, subject to the king's approval, against the destruction of the forests in general. Such municipal regulations relating to "protecting forests" and forests in general may probably also include compulsory regulations as to planting and sowing of forests already cut down. No other laws relating to forest culture exist in Norway.



Residence, belonging to the State of Minnesota, of the Superintendent of the **Itasca State Park**. Photographed, August, 1898, for the Annual Report of the **Chief Fire Warden of Minnesota**.



Mixed forest—large-leaved trees, pine and spruce—on southwest shore of **Lake Itasca**, in **State Park**. Photographed, August, 1898, for the Annual Report of the **Chief Fire Warden of Minnesota**.



The damage caused by fires in the public forests is inconsiderable. Many years there is none; and the damage done to private forests is of small account and unreported. The principal cause or causes of such fires is carelessness of owners, fishermen, cowherds, etc., as well as the burning of heather for cultivation of the land. The law of July 14, 1893, on "Fires in Forests and Fields," with the supplemental law of July 27, 1896, has provisions relating to the prevention and extinction of forest fires.

The central administration of the forests is directly under the department of the interior, without intermediate officers. The service is under the charge of the chief (the director of the forests), and there are 4 forest inspectors, 25 forest officers, 1 forest engineer, 2 assistants, 7 forest planters and 363 forest guards. The yearly salary of the chief (the director) is \$1,450, without additions. The inspector's salary is \$800, increasing up to \$970. The forest officers', \$480, increasing to \$800. All these functionaries have their traveling expenses paid when traveling in the service of the state. The officers and the inspectors hand in every year a report to the director, who publishes a report on forest matters generally every third year. The only forest periodical in Norway at present is the "Tidsskrift for Skovbrug," (Periodical for Forestry), published by the Norwegian Association for Forestry.

#### PRIVATE FORESTS.

The aggregate extent of private forests is 18,000,000 acres, of which about 276,000 acres are managed on forestry principles. The average value per acre is from \$4.28 to \$5.36, and the average annual rate of net income is from 55 to 60 cents per acre. The cutting undoubtedly exceeds the natural increase of the forests. The supply of wood is consequently decreasing, and the size of the trees decreases. The government purchases annually forests to the amount in value of \$21,440. It has three large and several smaller

nurseries. These supply the required number of plants to the public and to private parties. It has also four seed establishments, which supply the public and private demand for tree seeds. It also has two elementary schools of forestry, and it tries through its functionaries to instruct forest owners in rational management of the forests.

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## PRUSSIA.

### STATE FORESTS.

The extent of the state forests of Prussia is 6,955,227 acres. Included in this, however, are 715,637 acres not designed for tree culture. In addition, the extent of forests belonging to municipalities is 2,563,812 acres; belonging to churches, 207,752 acres; belonging to corporations, 555,900 acres; private forests, 10,828,730 acres; making an aggregate extent of 21,111,421 acres in the whole kingdom.

The prevailing kinds of trees in the state forests are Scotch pine, larch, beech, red pine, fir and oak. The value of the land varies so much, rising from a small amount to \$700 per acre, that it is impossible to give an average estimated value. The annual aggregate expense of administration (state forests) is as follows: The office expenses and maintenance, including expense for education in forestry, etc., averaged in the years 1893 to 1897, per annum, \$8,500,000. The annual aggregate revenue in the years 1893 to 1897 amounted to \$17,200,000, being at the net rate of \$1.50 per acre of actual forest. The number of acres sown or planted with forest annually during the years 1893 to 1895 was 44,830.

The foresting of the beech is mostly effected from standing trees, though artificial sowing and planting are also done. The oak is either reforested by seed from standing trees, or artificially through sowing or by planting. The

Scotch pine is first cut clean and reforested by sowing or planting, and the red pine the same. Sowing from standing trees is not common. In regard to the continuity of forests products, the forestry department endeavors to obtain the highest possible continuous net income. The usual method of cutting is in blocks clean.

Under the head of compulsory tree planting the following laws are referred to: The Forest Protection Law of July 6th, 1875; the law of August 4th, 1876, concerning the administration of forests owned by municipalities and public institutions in the provinces of Prussia, Brandenburg, Pomerania, Posen, Silesia and Saxony.

The average annual damage caused by forest fires in the years 1892 to 1896 was as follows: Totally or mostly destroyed, 2,992 acres; only slightly damaged, 117 acres; only the surface destroyed, 522 acres. The average annual number of forest fires in the years 1892 to 1896 was 36, the causes of which were as follows: 12 unknown, 2 railroads, 5 incendiary, 16 caused by carelessness, 1 lightning. During the years 1892 to 1896 the annual average number of forest fires caused by railroad locomotives was 2.

The officers in the forest service are equal in rank to the other high grade officers in the government service. The foresters have clerical rank. The salary of "Oberforster" (district manager) ranges according to length of service from 2,700 to 5,700 marks. Unfavorably situated officers receive an additional amount, the maximum of which is 600 marks annually. In addition there is usually free residence and fuel. The salary of the "Oberforstmeister" (chief inspector) is from 4,200 to 7,200 marks, according to length of service, which is calculated from the time of qualification for the office of "Forstrath" (councillor). The "Oberforstmeister" and "Forstrath" are each allowed an amount not exceeding 2,900 marks for traveling expenses.

Among the best German forest periodicals are the Forestry and Hunting Magazine, by Dr. B. Dankelmann, Royal Prussian "Land Forstmeister" (forest councillor) and



director of the forest academy at Eberswalde, and the Forestry Magazine, by "Oberforstmeister" Weise, director of the forestry academy at Muenden. "The forestry conditions of Prussia," by Julius Springer, Berlin, is also referred to.

#### PRIVATE FORESTS.

The extent of private forests in Prussia, as above stated, is 10,828,780 acres. About one-half of these forests are managed on forestry principles, and their average value is somewhat less per acre than that of the state forest. On the larger estates the area devoted to forests gradually increases, while on the smaller estates the forest area probably decreases.

Some of the forests of Prussia are attractive resorts for travelers, and especially pedestrians, who enjoy the excellent roads. Of the celebrated Thuringian chain, which is 70 miles in length by from 8 to 25 miles in breadth, a writer says: "The successive hills melt into each other in gentle undulations, forming a continuous and easily traced comb, and only the northwest slopes are precipitous, and seamed with winding gorges. This mountain range incloses many charming and romantic valleys and glens; the most prominent feature of its picturesque scenery is formed by the fine forests, chiefly of pines and firs, which clothe most of the hills."

Prussia comprises nearly two-thirds of the entire extent of the German Empire, yet its area lacks considerable of being twice that of Minnesota. Thirty-one per cent of its soil is predominantly sandy, and on the whole probably is not as good as that of Minnesota; yet it sustains a population twenty-five times as large as that of Minnesota. This fact might well find a lodgment in the minds of our statesmen, that whereas Prussia annually derives a net revenue of \$1.33 an acre from her 6,000,000 acres of state forest,

our state, from about an equal area of land in its borders, adapted to forest, derives no regular net revenue at all.

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#### WHAT A MAINE TIMBER EXPERT SAW OF GERMAN FORESTRY.

Mr. Austin Cary, a timber expert of Bangor, Maine, who lately visited Germany to study its forestry, furnishes a very interesting and valuable paper on the subject in the report of the Forest Commissioner of Maine, from which I take the following extracts:

It is my purpose here to try to give some little idea of German forestry. Germany is an old country. Centuries ago what we might call its virgin timber was exhausted, and the country found itself with a dense population dependent on a limited area of land to supply its needs for wood material. What should they do? Should they stint their use in this direction to a niggardly amount? Should they exploit new territory and call on the stocks of newer countries for their supply? They did neither of these things. They went to work rather on their own soil to develop fully the resources and capabilities of their own land. The states and the nobles supported the work. Scientists labored and managers experimented. Forest schools were established to spread through the land the knowledge of what had been gained. Finally they piled up a mass of exact information about trees and everything related to their life, and established a system of forest management based thereon that is one of the finest monuments of the thoroughness, the conservatism and the patience of the German race. And to-day the forest stands as one of the prime objects of the people's regard, a source of health, wealth and national independence.

This report is concluded after several months' study on the ground of the forests of South Germany. As illustrations of what scientific forestry can do I wish to tell of a few representative facts that came under my own observation.

The first forest of which I gained any knowledge was the property of the city of Freudenstadt in Württemberg. I remember thinking, as I rode up to the place by rail and found it a city of 6,000 inhabitants, that it wouldn't do for a man like myself, who wished to see nothing but woods from morning till night, to live in the city. I would get off into the woods themselves and live. How great was my mistake! The forest was all about us. In five minutes' walk from the center of the city one could step into such fine woods as cannot be found in

the whole state of Maine. Spruce and fir trees two to three feet through and all the way up to 130 feet high stood on the ground as thickly as they could stand. There were acres there that would cut more than 100,000 M. The previous summer I had cruised all through the spruce lands of the Kennebec, and here on single square miles was more timber than on whole townships on that river. And the best of it was that this was no new or exceptional thing. The whole area of the forest was doing it. If it hadn't old timber it did have young, which is quite as essential to the result. They were growing that timber right along because they knew how to do it and because they were patient enough to wait for results.

The financial returns from this forest will be of interest. The yearly net revenue derived from its 5,950 acres had amounted in the last few years to from \$20,000 to \$25,000. The yearly yield of wood had been 106 cubic feet per acre. The revenue paid all the municipal expenses of a city of 6,000 people, relieving the citizens from local taxation and paying a bonus to each voter besides.

Baden Baden is another good illustration. The city owns 10,000 acres of forest land in its immediate vicinity, kept under the best of management, just about the equivalent of half a township of our Maine timberland and in much the same kind of trees. The yearly net revenue from this tract, as an average from 1881 to 1891, was nearly \$3.50 per acre. That is about the total valuation, timber, land and all, of a pretty good Maine township. A yearly net income of \$35,000 has here, it can readily be understood, a significance in connection with municipal expenses.

These two instances are by no means exceptional. The Black Forest, in which both these tracts are included, is a region of high and rough land about a million acres in extent, partly in Baden and partly in Württemberg. It is well cut up with railroads and turnpikes; it has towns and villages scattered all through it, but much the greater portion of its area is covered with trees. It is divided in ownership between the states, cities and towns, and private individuals, of which the publicly owned forests are uniformly well managed. The state forests throughout this district yield a net yearly revenue of \$2.50 per acre. Tracts of unusual productiveness have yielded \$10. The best feature of the situation is the certainty and regularity of the supply. The management is splendid in its conservatism. Timber is never cut till it is ripe. Managers take a pride in never making a false show by overcutting. The yearly growth on these forest areas is closely known. Mills and markets have adjusted themselves to their output, and business in consequence is regular and certain.

In speaking of these results of German forestry we must not mistake the conditions to which they are in part due. German forest land in the first place is superior to ours. The soil is deeper and better as a rule, because the country was never glaciated in any such way. Some of their tree species, moreover, are faster growers than our own, though they have nothing equal to the American white pine. Then wood material in German forests is worth much more than in our woods, because it is close to a dense population which needs it. German forest management, however, is in itself a noble achievement. Without it, favorable natural conditions would be of little avail. By its means Germany, devoting a third of its territory permanently to forest—that third which is of smallest value for agricultural and commercial use—has been able not only to supply all her own demands for most kinds of wood material, but to furnish large amounts to less provident neighbors.

With these facts in mind as to the results of German forest management, the way is perhaps prepared for a statement of how they have been attained. Here we must be extremely brief. I propose as that bit of German forestry which seems to have most help in it for us in studying how to make the most of the woods of Maine to give in outline the history of a stand of spruce and fir in the Black Forest as it works out under the guiding hand of an Oberförster of the Baden State.<sup>1</sup>

First of all, how does it start? How do the young trees come there? Most readers probably will think they are planted, but such is not the case. The man who has a big bill for nurseries and planting in his accounts is marked as a poor manager, and another may be found to take his place. No. It is rather by understanding the conditions which seeds require to germinate and young trees to thrive in, and making use of this knowledge in clearing off the old crop, that the young stand is founded. Let us, however, omit this for the present, and taking the young stand when it first has possession of the ground, trace through its history.

A twenty-year-old stand of spruce and fir<sup>2</sup> in the Black Forest looks like one of our thickets that we say is as thick as the hair on a dog's back. The little trees stand closely together, their foliage is high up, and the limbs on the lower trunk killed off. Many of them by force of competition die every year, and when big enough the dead ones are taken out for fuel. And this dense condition is desired and promoted.

<sup>1</sup> Scientific readers must not hold me to strict accuracy here.

<sup>2</sup> "Spruce and fir." The European "spruce" is the Norway spruce, a very valuable timber tree, and so called because naturally more abundant in Norway than in any other country. The "fir," also called the "silver fir," is the *Abiespectinata*, also a spruce, and common in Europe, but not quite as valuable as the Norway spruce. What is known as "fir" in the United States east of the Rocky Mountains is our common balsam—*Abies balsamifera*.

The unbroken cover of leaves keeps the soil moist in summer so that growth is more rapid than it would otherwise be; the dense crowding cleans the lower trunk of limbs so that the heart lumber of the mature tree will be nearly clear. The trees on an acre of German forest are of approximately the same age. Experience has shown that more lumber and better lumber in the long run can be grown in that way than if trees of all sizes are kept on the ground at the same time.

Such is the condition of things up to forty years of age. The young stand is practically allowed to take care of itself, and this it does to entirely good advantage.

At forty years of age, however, at which time the young trees might be four to eight inches in diameter and fifty feet high, a strong thinning is made. Poor and deformed trees are taken out, those that are diseased as well, and such also as are overcrowded and seem destined to an early death. By this means the stand is much improved. Every tree left standing is one that is straight and good, and it has a good chance to grow. The stand by this treatment may be left pretty open in places, but in the next few years it closes up again. The trees stand as thickly on the ground as they can stand. The dense foliage shields the soil from drying out, and prevents the encroachment of bothersome weeds. The density of a middle-aged stand in a German forest, the completeness with which it occupies the ground, is something hardly to be conceived till one sees it. Second growth pine groves are all we have in this country that approaches it. The shade of the foliage is so dense and complete that not a young tree or bush will be seen for rods. All that covers the soil is a fine, even coating of moss.

So the thing stands for forty years more. Only the trees that are crowded out are removed from the ground. These have a value to sell but none to grow. Most of them go into the manufacture of paper.

At eighty or one hundred years of age, however, another condition of things begins. Spruce and fir at this age will no longer stand densely together. They open of their own accord. Through blow-down or disease, also, little openings in the cover occur, and under these openings, where the sunlight gets down to the ground, a strange thing happens. Little seedlings, which up to this time may have been absolutely lacking, though the ground was showered with seed, begin to appear on the ground. Sometimes there is a perfect mat of them, and the forest manager, remembering that the time is not far distant now when his timber will be mature, when he will have to cut it and will want to replace it with another of the same kind, welcomes their appearance and cares for their welfare. As they grow larger and require more light and air, he opens up the old stand around them. With that, too, the patch of young trees spreads. More thinning out assist



Young and mature Norway pine on a school section (given to the State of Minnesota by the United States) in Beltrami County. Illustrates what many misinformed people deny, that pine will succeed pine by natural seeding. If circumstances are favorable. Gradual clearing and gradual admission of sun are generally followed by the springing up of young pine if fires are kept out.





it; different regions of thinning run into one another. Finally the whole area of the stand has been lighted up, young trees have followed the favoring treatment and a dense crop of them covers nearly every square rod of the ground. Much of the old stand has in the meantime been reaped. What remains to be done is simply to clear off the balance with due regard for the welfare of the succeeding stand. By these measures and on these principles the land, in the course of 120 years, handled, of course, meanwhile by many individual managers, but always with regard for its productiveness in the long run, has produced a magnificent crop of timber, has yielded in the thinnings material much more than paying for the labor of its cutting, and it has afforded steady labor at about the rate of one man per 100 acres to four generations of men. During the last thirty or forty years of that time, simply by gradual removal of the crop and care for the young growth which succeeds correct handling of the conditions of light and soil, a new crop has been started ready to carry on the same process in its turn.

How much of the German practice may be adopted here to advantage, how much of it is possible under our business conditions, can only be told after trial. Whatever we do adopt will be gradually taken up. Many of the measures that are recommended from that source are the same that have been suggested to us already by the facts of our own woods.

Something we must take, however, from the general attitude of the German people to the forest. The facts of the situation, indeed, will compel us. The forest will have to be regarded as a field rather than a mine. Having attained that, we shall have further to learn conservatism and patience. Patience is an essential in successful forest management. Trees grow but slowly to a mature condition. If they are cut before they are fit, the best results, the greatest aggregate returns, cannot be reaped.

On most sites the first principle of forest management, as it must come here, is that principle so often referred to as being already in the minds of our practical men—sparing the small trees. This policy is rendered all the more desirable by the fact that has often been pointed out in the course of this work, the vitality of spruce under shade, its ability to thicken up and grow after long and severe suppression. This policy, as often indicated in this work, will have to be applied with discrimination. The problem of windthrow will be a most troublesome one. The man who has to decide whether timber can be safely left, or whether if left it would merely be condemned to blow down, will have set him oftentimes a very difficult problem.



One great object of conservative forest management, however, will be the preservation of the small trees. With this in view many changes in our present lumbering methods will doubtless in time be made. In some directions the detail of the German practice may help us. Thus, the Germans avoid cutting in the coldest weather when wood is brittle. On the other hand, they like to cut when there is deep snow. That saves the little trees from destruction in felling.

A cardinal principle of the German practice, having value in this as well as in other connections, is never to clear off the whole or the bulk of a stand at any one time. This treatment greatly helps the young trees. Comparatively few are killed when but a portion of the overgrowth is taken, and injuries received they have opportunity to repair. Where a whole stand is cleared off at once little in the way of young growth will survive it.

How far we may be able to follow the example set us it is impossible without trial to say. Perhaps it will be possible in the not distant future to leave half the merchantable timber in a virgin stand for further growth. Such a course would insure a great volume growth on the land; it would allow each tree to be kept till it reaches the finest development; it would help to maintain the proportion of spruce seed supply needed to keep possession of the land. \* \* \*

In Germany the workmen in the forests are trained, almost skilled, laborers. They work all their lives at their business; they are well paid as labor goes in that country; living with their families in the forest, they are put in no such social conditions as are the men in our woods. The German forest laborer is a steady, well conditioned, contented man, who takes a pride in the forest in which he works.

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## DUCHY OF SAX-MEININGEN.

The area of state forests is 106,530 acres; of communal forests, 84,460 acres; of private forests, 71,850 acres; miscellaneous, 1,480 acres; in the aggregate 264,310 acres, being equal to 42.4 per cent of the total area of the state. The state forests comprise 24 units of administration, in charge of 24 superior forest officers. The highest functionary in forestry matters is the president of the forestry bureau. The bureau is composed of five forest counselors, two of whom act as forest inspectors at the same time,

each one supervising 12 of the above named 24 forest officers. The annual yield of the state forests is 5,779,669 cubic feet of lumber and fire-wood cut in ripe forests, and 1,288,904 cubic feet of fire-wood and pulp-wood obtained from thinnings. These figures correspond with an annual yield of about 155 feet board measure of lumber plus 0.40 cords of fire-wood per acre per annum. The state forest officers at the same time control the management of the communal and private forests within the state. All grades of forest officers have certain police duties concerning forests, fish and game preservation.

The municipalities owning forests are required to appoint well trained foresters for the management of their forest realties.

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## SAXONY.

### STATE FOREST.

The aggregate area of the state forest is 432,000 acres. The forests are scattered over the Erz mountains themselves and over their outskirts. They are further situated in a few smaller and separate mountain ranges and in the plains. The altitude at which the state forests are found ranges from 100 to 1,200 meters, or from 328.1 feet to 3,937.2 feet, above sea level. The first group of forests, in the Erz mountains, is pretty compact and comprises 200,000 acres. The second group in the outskirts of the Erz mountains and in some smaller distinct mountain ranges comprises 136,000 acres; and the third group in the plains comprises 96,000 acres. The soil consists of decomposed granite, granulite, gneis, mica-slate, clay-slate, grauwacke, porphyry, sandstone and some basalt. In the plains there is diluvium and alluvium. Only a very small portion of the forest area might be deemed fit for agricultural use.

The principal tree species are spruce, *picea excelsa* (Link); Scotch pine, *pinus silvestris* (L.); silver fir, *abies*

pectinata (D. C.); larch, *larix europæ* (D. C.); rothbuche, *fagus silvatica* (L.); oaks, *quercus pedunculata* (Ehrh.), and *qu. sessiliflora* (Sm.); hornbeam, *carpinus betulus* (L.); ash, *fraxinus* (L.); several maples, namely: *acer pseudoplatanus* (L), *A. platanoides* (L); further, several species of elm, *ulmus*; of birch, *betula*; and of linden, *tilia*. The prevailing species is spruce.

The value of the state forests, including timber and soil, aggregates \$76,490,000. Hence the value per acre is \$177. The annual expenses for administration for the year 1896 were \$1,040,000. In the year 1896 the annual gross revenue amounted to \$2,986,000; the annual net revenue to \$1,946,000.

The entire area planted annually varies according to circumstances. On the average it will reach 6,900 acres. Of these 6,900 acres 800 acres are planted up with seeds and 6,100 acres are planted up with plants. About 20 per cent of the above figure 6,900, or 1,380 acres, consist of blanks in plantations previously made where the original planting has failed. Thus it appears that the area planted for the first time after the removal of the old crop is only 5,520 acres. The question whether plants or seeds shall be employed for restocking cleared ground depends on the condition of the soil. As a general rule, seeds are planted only on such areas which do not produce grass and weeds to a large extent and which at the same time are of sufficient fertility and well protected against late frost. The sowing or planting of seeds must be done not later than in the second year after the final removal of the former tree crop. Strips about three feet wide or places about six feet square are cultivated with a spade before the seed is thrown on them. Only in rare cases the entire area to be planted with seeds is ploughed and harrowed and the seeds spread over it broadcast. The plants used for planting up a clearing are as a rule two years old or older. The age of the

plants selected depends on the condition of the area to be planted aside from depending on the species itself. Spruce, scotch pine, fir and larch or tamarack, as a general rule, are used two to five years old; beech, oak, ash and maple, as a general rule, are used three to six years old. The plants are raised in nurseries. Only in rare cases they are taken from areas previously planted with seed in the open forest. The number of plants used per acre ranges between 600 and 4,000, according to the species, the size of the plants used and the condition of the area to be planted.

Regeneration from self-sown seed is only used in the case of the beech (*Fagus silvatica*). In all other cases forests are regenerated by means of planting plants or sowing seeds.

There is no law or rule in Saxony for compulsory reforestation after clearings.

There is not much damage done by forest fires. It averages \$300 per year. Forest fires of a larger extent have happened very rarely. As a rule, forest fires are caused by the careless use of matches by tobacco and cigar smokers. Very few fires are caused by sparks from locomotives; on the average perhaps three per year.

The yield or annual cut is fixed by working plans prepared for periods of ten years and renewed after the lapse of such periods. Within these periods the annual yield is almost constant. At the end of a period, however, a new working plan might provide for either a higher or lesser yield. It is an iron-clad rule that on the whole the cut shall not exceed the increment of the forest.

Trees are cut as low down as possible above the surface of the soil; the instrument used is the saw. The stump and the root are dug out afterwards wherever such work is remunerative, viz., where the wood obtained can be sold at a paying rate. In Saxony regular forest management began with the beginning of the century in a systematic way; con-

sequently the forests now existing are almost even aged and composed of trees of almost even size; hence there is no objection to clearing an entire area of given size, say of two or three acres, at once, removing from it every tree standing on it. In exceptional cases, pieces of forest not entirely mature may be sacrificed with a view of saving others from the dangers threatening from storms and insects.

The average age of maturity in Saxony for conifers (spruce) is eighty to ninety years. However, there are cases in which this rule is not adhered to. The size of trees when fit for the axe depends entirely on the species, on the condition of the locality, the means of transportation, etc. Previous to the final cutting, and beginning with the twenty-fifth year of a piece of forest, and ending at the sixtieth year of the forest, thinnings take place at intervals of about ten years with a view to allow increased light and increased space to the most promising specimens of the growing stock. Specimens growing less vigorously, dying or dead, are removed at the same time wherever it pays.

There is no difference in the rank of the forest officer compared to that of any other state officers employed in the technical branches of the government. The state forestry service is divided into a lower and higher branch. The professional training for the first one is a merely practical training, whilst the latter necessitates scientific preparation of a high class. The requirements with reference to this scientific preparation are as follows: Graduating from a state gymnasium; six months of practical instruction under a forest officer on one of the state forest ranges; twelve months' study at a university; two and a half years' study at the forest academy at Tharandt, at which two examinations must be passed; three years of practical professional training under a forest officer and at the bureau of forest working plans at Dresden; examination by the state authorities. After this preparation, as soon as there is a

vacancy, appointment as government officer might follow, to begin with as assistant of an Oberförster (Superior Forester); then as superior forester, and so on up to the higher ranks of chief of a forest territory or chief of the bureau of forest working plans. The latter officers have the title of "Superior Forest Master." The highest technical authority controlling the local and territorial officers is called "State Forest Master." There are 108 local ranges in Saxony allotted to 11 territorial districts. The former are in charge of a superior forester (Oberförster), the latter in charge of a superior forest master. The central bureau of the entire state forestry service is under the Secretary of Finances.

The salary of a superior forest officer averages \$1,015 (from \$1,150 to \$1,180), to which must be added an allowance of \$566 for traveling expenses, horse keeping and the use of a house free of rental. The salary of the Superior forest master averages \$1,486, ranging from \$1,274 to \$1,698, to which must be added a traveling allowance of \$708 and the use of a house free of charge.

In the case of physical disability the forest officers draw a pension depending on the duration of their state service and on the salary received so far. This pension is at least 30 per cent of the salary. In no case does it amount to over 80 per cent. The latter figure is paid after thirty-nine years or more of state forestry service. At the age of sixty-five years the state forestry officer is entitled to a pension in case he desires to retire, even if his constitution would enable him to continue in the service.

No annual report of the Saxony forest administration is published.

"Das Tharandter Jahrbuch" is considered the best periodical on forestry.

As further information, it may be stated that the administration of a forest range, by the superior forester under the supervision of the superior forest master, is outlined by

"the working plan" which is prepared by the bureau of forest working plans at Dresden, containing prescriptions for a period of ten years. The superior forest officer co-operates in the preparation of this working plan, which has to be submitted to the secretary of finances. The preparation of a working plan is based on a thorough knowledge and a thorough scrutinizing of the conditions of the forest range, which often takes several months. The forest working plan contains a statement showing the areas of the different compartments or units of the forest range; it contains a description of these compartments and maps of the same; all sections of the forests are examined with reference to their increment. All these investigations made, the forests or sections of forests to be cut during the next decade of years are selected and pointed out specifically. Further, there is stated specifically what compartments or sub-compartments are to be thinned out, what areas are to be planted up, and by what means regeneration is to be effected in each single case. Deviations from the prescriptions of a forest working plan must not be made unless authorized by the secretary of finances. Every working plan is controlled by the state forest master in the range itself. Besides, in the midst of the ten years period, or after the lapse of five years, such a control by the highest forest officer of the state takes place, so as to find out whether and in how far the prescriptions of the working plan have been followed and whether deviations might be advisable.

The sale of the forest produce (timber, fuel, bark, stones, etc.) is done by the superior forest officer with the help of a local state cashier, who is holding an office absolutely independent from the forestry service and is directly subordinate to the secretary of finances. This arrangement makes embezzlements practically impossible. The sale of timber and fuel takes place, after they are cut and piled up, by means of public auction. The cutting and piling of timber and fuel is done by common hands working under a con-



White cedar, a little northwest of Hibbing. One of the most valuable of Minnesota trees and being rapidly slaughtered for railroad ties, telephone posts and other purposes. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



Pure stand of jack pine, about ten miles southwest of Bemidji. Jack pine is found on the poorest soil, and though very much inferior to white and Norway pine, it yet has commercial value. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.





tract. Any planting, on the other hand, is done by day workers, under the supervision of the local rangers, so as to warrant careful work.

#### PRIVATE FORESTS.

According to a statement made for the year 1893, the total area of the private forests in Saxony is 539,000 acres. All forests owned by municipalities and villages and other corporations, and a considerable fraction of the larger private forests, are managed according to true forestry principles. All administrations of municipal, town and village forests are controlled by the state. The working plans for these forests are prepared by the bureau of forest working plans at Dresden. In these cases, the forest working plan is approved of by the secretary of the interior, and not by the secretary of finances, as would be the case for state forests.

It is impossible to give any data as to the average value per acre of communal and private forests. Neither are data available as to their average annual yield. Generally speaking, the yield of private and communal forests is considered to be lower than from state forests. Wherever there are working plans the cut is steady, and even during the period over which the working plan extends. Where there are no working plans, the cut depends entirely on the pleasure of the owner.

Small holdings of forests, especially those of the peasantry, are deteriorating. Parts of such forests are changed into fields or meadows; other sections are purchased by the state, communities or wealthy private individuals.

#### OBSERVATIONS ON THE FORESTRY OF SAXONY

BY DR. C. A. SCHENCK.

Under date of Biltmore, N. C., Nov. 16, 1898, Dr. C. A. Schenck, at my request, furnished the following observations:

Answering your note of November 11th, relative to the money yield of Saxon forestry, I want to state:

During the years 1884-'93 the yield of Saxon forestry per acre was as follows:

	(A) Cubic Feet.	(B) Price per Cubic Foot.	(C) Total Value.
1. Timber (diameter above 3 inches).....	55.73	\$0.0938	\$5.23
2. Fuel (diameter above 3 inches).....	14.29	.06	.83
3. Fagots (diameter below 3 inches).....	17.15	.04	.63

Column (A) gives the yield in cubic feet solid.

Column (B) gives the value of the stuff per one cubic foot solid.

Column (C) gives the gross returns obtained from the sale of such yield per acre.

Remarks to 1: Generally speaking, 1,000 cubic feet solid should furnish 12,000 feet board measure of lumber. However, even in the case of great economy, 1,000 cubic feet solid will not furnish more than 4,000 feet board measure. This is my experience from actual sawing at the mill of the Biltmore Lumber Co., and the same appears from Pinchot's and Graves' pamphlet on the white pine, page 54. Consequently 55.73 cubic feet solid, the figure given in column A, will yield not more than about 225 feet board measure, Doyle's rule, assuming, however, that the logs are used up only to a diameter not less than eight inches.

Two hundred and twenty-five feet, board measure, which the Minnesota lumbermen would obtain from the 55.73 cubic feet of timber, are worth in Saxony \$5.23, as appears from column (C), consequently 1,000 feet, board measure, would be worth \$23.45. This figure would seem to you and to Minnesota lumbermen extraordinary. You should recollect, however, that this is the value of timber cut and piled up along good forest roads, which roads connect either with river courses or with macadamized public roads near by.

The lumberman in Saxony, however, gets more lumber than is contained in 1,000 feet, board measure, for the \$23.45 which he pays for the equivalent in cubic feet. He uses the logs up to a diameter of say three inches. There is practically no waste from slabs, etc. If there was no waste at all he would get 3,000 feet, board measure, out of the wood worth \$23.45, but there is some waste even in Germany, and we might say that the stuff which will yield the German mill men 1,000 feet, board measure, when piled up along good forest roads, is worth to him \$10.

The fact that the German lumberman is buying after cubic feet and that the American lumberman is buying after Doyle's rule makes comparisons very difficult. It is a general experience that Doyle's rule underestimates logs of a small diameter. The same will appear to you from my Pamphlet on Yellow Poplar, which I think I sent to you some time ago, and where I compare the actual output from logs with the output given by Doyle.

In Saxony the trees are not allowed to reach an average diameter of, say, more than 12 inches at breast height (4 feet from ground), consequently the difference between the data given by Doyle's rule for such trees and the actual contents of such trees in cubic feet multiplied by 12 are at great variance.

Remarks to 2: One cord of firewood contains 128 cubic feet of space, partly filled by wood and partly by air. The solid wood contained in a cord does not amount to more than about two-thirds of 128 feet, or to 86 feet, the balance being air space.

Fourteen and twenty-nine one-hundredths cubic feet, the figure which you will find in column (A), represents about one-sixth of a cord of firewood. The price of a cord of wood worked up and piled up along good forest roads is in Saxony \$5.16; the price of one-sixth of a cord, as indicated by column (C), is about 85 cents. This price will frighten you, and others as well. Of course, fire-

wood is worked up only close to the cities, whilst in the mountains all the poorer stuff is left in the forest.

You are right in pointing out that in many European states the poor people are allowed to gather branches and decaying wood in the forest, often having prescriptive rights for such use. In Saxony, however, if I am not mistaken, prescriptive rights have been bought up entirely by the government, and it is probably only near the cities that the poorer classes are gathering branch wood in the forest.

Remarks to 3: Seventeen and fifteen one-hundredths cubic feet of solid wood fibre contained in branch stuff will pile up to about two-thirds of a cord. A cord of fagots is worth about \$1, piled up in the forest along good roads. Two-thirds of a cord is worth about 68 cents, as indicated in column (C).

The returns from fuel and fagots which the Saxony forest is yielding, the Minnesota forest will not yield for a very long time. The comparison, therefore, of Saxony and Minnesota forests should be based only on the timber output.

Here we must bear in mind that the population of Saxony is thirty-nine times as dense as the population of Minnesota and over twice as dense as the population of Massachusetts. We must further bear in mind that the yield of the Saxony forests consists largely of spruce wood, the smaller pieces of which are very valuable for wood pulp, whilst the larger pieces furnish first class butt logs.

We must further recollect that a network of splendid public roads, well graded and well macadamized, are trenching even the remoter mountain districts of Saxony, and that the industrial development of Saxony stands foremost in the German Empire.

Let us imagine that the entire state forests of Saxony were suddenly transported into Minnesota. What would the yield of these forests be under the prices and the conditions prevailing in Minnesota at the present moment? The yield per acre per annum of raw material having over eight

inches diameter at the small end would be 225 feet, board measure, Doyle's rule, per acre, the stumpage of which stuff, standing in the woods, would be worth about \$4 per 1,000; consequently the gross receipts per acre per annum would amount to 225 by 4 divided by 1,000, equal to 90 cents. From this figure there must be deducted only the expense for taxes, administration and protection, which will amount to about 5 cents per acre per annum, leaving a net profit of 85 cents per acre per annum from the forest.

Figuring at 2 per cent, this net yield would correspond with a forest value of \$40.50 per acre.

It seems to me very likely that for Minnesota a higher rotation than the 80 years rotation adopted in Saxony would be indicated. If it was possible, the average diameter of the mature tree would be over twelve inches in diameter, and consequently the yield per acre would be considerably higher, in my opinion.

If any one should ask for an explanation how Saxony, although the yield per acre per annum is only 225 feet board measure, Doyle, draws a net return of \$4.50 per acre from her forests, I think the answer is easy. The gross receipts per acre figured out from column (C) in the above statement add up to \$6.76. To these gross receipts may be added certain receipts for hunting and fishing, of which however no figures are available. If we neglect them, and if we deduct the cost of administration, lumbering, road building, etc., etc., which amounts to about \$2.40 per acre, we reach the figure \$4.36 as representing the net yield per acre of the Saxony forests. The answer desired lies in the following:

First: The Saxony lumberman gets almost three times as much lumber out of 225 feet, board measure, Doyle, as the Minnesota lumberman.

Second: Fuel and fagots have a considerable value wherever the forest is close to town.

Third: The population of Saxony is very much denser than the population of Minnesota and the industrial development in Saxony is almost unrivaled in Germany, consequently the prices of forest produce in Saxony are considerably higher than those in Minnesota.

### GRAND DUCHY OF SAX-WEIMAR.

The area of state forests is 110,910 acres, of private forests 120,510 acres, in the aggregate 231,420 acres, being equal to 25.6 per cent of the total area of the state. The state forests comprise 37 units of administration, in charge of 37 superior forest officers, trained at the forest academy of Eisenach.

The control of the local forest administration is effected through six forest inspectors, the highest authority in forestry matters being represented by a forestry bureau, attached to the office of the secretary of finances. Forest working plans are prepared and their execution controlled by the "Commission of Forest Working plans," at Eisenach, the director of the forest academy being at the same time chief of that commission. The annual yield of the state is 5,864,177 cubic feet of lumber and fire-wood, corresponding with about 125 feet board measure timber plus 0.31 cords fire-wood per acre per annum.

The main duties of the superior forest officers consist of: Care of the property, maintenance of boundary lines; preventing the acquisition of prescriptive rights to pasture, litter wood, etc., by outsiders, and preventing forest offenses; maintenance of the growing stock of timber; forest utilization and forest regeneration, as prescribed by the working plans; sale of forest produce and control of the book-keeping.

## SWEDEN.

## STATE FORESTS.

The aggregate extent of the state forests of Sweden in 1895 was 18,080,753 acres. The area of state forests is annually increasing by extensive purchases of private forest. The prevailing kinds of trees are spruce (fir), pine and birch. The estimated value of the state forests is \$4 per acre. The figures in this statement are for the year 1895, in which the aggregate expense of forest administration was \$185,397, and the aggregate revenue was \$1,126,636. The number of acres sown or planted to forest was 10,875. The number of acres damaged by fire was 1,200, and the amount of damage was about \$10,000. Neglected camp fires and carelessness when burning fields for cultivation are the principal causes. Only three fires were caused by railroad locomotives. The state forests are divided into 9 districts and 74 ranges ("revir"). The chief of a district is an officer entitled "Öfverjägmästare," with annual salary of \$1,707 and rank corresponding to the rank of major in the army; the chief of a range ("revir") is an officer entitled "Jägmästare," with a salary of \$1,200 and rank corresponding to that of captain in the army. Before any one can be appointed as "Jägmästare" he must have passed successfully the examinations required after a year's attendance at one of the forest schools, the examinations required during a two years' course at the College of Forestry at Stockholm, and must have practiced forestry a year on a range. Foresters or guards receive a salary of \$160. The state provides dwellings in the vicinity of the forests for officers and foresters. At the head of the forest administration is a director general, with salary of \$2,400, and having rank corresponding to that of a major general in the army; and a chief of bureau, with salary of \$1,867 and rank corresponding to that of a lieutenant colonel in the army.



There is a continuity of forest product based upon certain plans of cultivation. Reforesting is effected partly by sowing, partly by planting, but principally by seeds from standing trees, assisted by planting. The usual method of harvesting the forest crop is, in the southern part of the country, by cutting in blocks clean; in other parts of the country by cutting trees only down to a certain size fixed by law. The total forest product of the country is sustained, and it is increasing.

#### PRIVATE FORESTS.

The aggregate extent of private forests is 58,715,135 acres and their average value per acre is estimated at about \$5. About twenty-five per cent of private forests is managed on forestry principles. A royal committee is preparing a project of forest laws to promote regrowth of private forests.

#### FORESTS OF THE UDDEHOLM COMPANY, SWEDEN.\*

The forests of the Uddeholm Stock Company are situated in nine parishes in the province of Vermland and in two parishes of the province of Dalarne. Karlstad, on Lake Wenern, about fifty (English) miles distant, and Gothenberg, about one hundred and eighty miles distant, are the nearest export harbors. Lake Wenern is connected with the Baltic and also the North Sea by the Gotha and Trollhatte (canals). The company owns fifty-six miles of railroad—Nordmark-Klarelfven—with thirteen stations, which transports all sorts of goods, especially iron and lumber, to and between the works. The company owns 400,000 acres of land in Vermland and 25,000 acres in Dalarne. About 60,000 acres have been acquired within the last ten years. Of the entire area not exceeding 60,000 acres consist of naked tracts, fields, meadow, also unproductive sur-

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\*Information furnished in Swedish by Dr. Fredrik Lovn, chief forest master, through Mr. Gust. Jansson, manager of the Munkfors Iron Works.

face of moss, lake and rocky elevations; while at least about 375,000 acres consist of natural forest-bearing land. Hereof perhaps 15,000 to 18,000 acres are pasture land. Pine comprises 70 per cent of the forest, and spruce 30 per cent of all trees large enough for the saw. The birch is the prevailing species within the pasture, but among the birch conifers are generally found.

The Uddeholm Company's lands lie on both sides of the Klar river along its middle course. The parish of Råmen, in Vermland, and the boundary of Dalarne terminate the extent of the property on the east and the two judicial districts of Fryksdal on the west. About 375,000 acres lie in one body. Only a very little public forest and some belonging to farmers are included therein here and there. The rocky elevations consist of primary rocks, principally granite and gneiss, with interspersed hills of hyperite. West of the Klar river red iron gneiss is almost the prevailing rock, but east of the same river granite prevails, in large part solid, not crystalline, but there are large tracts of primary granite poor in feldspar. On granite, pine prevails to the extent of 75 to 80 per cent, while on gneiss spruce occupies at least 40 per cent of the surface. On the "hyperite" hills spruce of large growth prevails. The soil in the forest is composed partly of the disintegrated rock such as above mentioned and partly of deposits of older or later water courses. Much of the soil is gravelly; much also is sandy. The Klar river within the region of the Uddeholm forest is 400 feet above the sea, and on the east and west sides rise very steep hills which at a distance, generally of a thousand yards, attain a height of from 1,000 to 1,500 feet above the sea; thereafter they take a plateau form, but are very often broken by water courses or bogs. The whole region is thereby in a large degree of that cut or broken character which one can readily obtain an illustration of by ascending one of the principal heights. The highest and only actually barren-topped mountain in the company's forest is Harf-

jellet, 2,200 feet above the sea. Another, Tönnet mountain, 1,700 feet above the sea, is called a "tjell" (barren-topped or snow-covered mountain), but it is not actually that, for it is partly forest-covered.

Agriculture takes a subordinate place; the land most suitable for cultivation is generally along the banks of the larger streams. About 700 persons occupy small farms as tenants and are obliged to produce certain quantities of charcoal, in general 6,600 bushels each and in all 4,620,000 bushels. They are also obliged to transport the coal to the works. Besides, there are several hundred forest laborers with smaller premises on which one or two cows and several smaller animals are fed. About 14,000 persons live and gain their livelihood on the company's property.

About 3,000 acres (2,700 to 3,000 "tunnland"; one tunnland being equal to 1.22 acres) are consumed or cut over annually; though it is not easy to say just how much, because clean cutting and selection cutting (cutting only the larger trees) are both practiced. On an average every tunnland (1.22 acres) ought at the end of every rotation period—120 years for pine and 90 years for spruce—yield from 4,000 to 4,500 cubic feet of lumber.

The forest is handled by means of cutting trees that hinder the growth of others or which are themselves defective ("hjelp-och rensningsgallringar"), and thinning to admit light ("ljushuggningar"), consisting of two to three careful timber cuttings with an interval of 15 to 20 years, which end either by leaving seed trees or in clean cutting. The best stands of pine are finally cut at the age of from 130 to 140 years, and the middling at the age of 120 years, and the poorer at the age of 100 years. The spruce stands in which thinning is much practiced are nevertheless very sensitive to damage from excess of light, wherefore timber cutting must be undertaken with great care and skill, otherwise drought occurs. Spruce is cut at the age of 70 to 100 years, according to its quality. During the past ten years there has been cut

yearly 12,000,000 cubic feet of lumber of various sorts, namely, of saw and building timber, 2,000,000 cubic feet; spruce for paper pulp, 850,000 cubic feet; telephone and telegraph poles, 125,000 cubic feet; firewood, 2,275,000 cubic feet; wood for charcoal, 6,600,000 cubic feet; miscellaneous, 150,000 cubic feet. Besides, there was each year brought to the works and consumed stub-wood to the amount of 1,500,000 cubic feet.

Certainly not more than 15, or at the highest 20, per cent of the cut-over area becomes restocked by natural seeding. The cuttings are not so large but what the bystanding trees can in an essential degree contribute to renewal, and, besides, very often 15 to 20 seed trees are left on each 1.22 acre tract. The difficulties which forest culture meets with in this locality are very stony land, spring and summer drought, spring frost, sometimes, as during the previous year, excessive rain, mossy or swampy land and land heavily pastured by cows and sheep. On the other hand, the forest area is not much troubled with heath, strong growth of grass, insects, etc. In regard to sowing, the twigs are burned immediately after the frost is out of the ground, and while the ground is damp. Generally the following year the cleared area is sown with pine and spruce seed. On pine land spruce seed is mixed to about 50 per cent. On land which is suitable for both, 60 to 70 per cent of spruce seed is used. On pure spruce land 15 to 20 per cent of pine seed is mixed in. On cleared land, to prevent injury from drought, long, narrow seed strips—made by hatchets—are used about a yard apart, not large squares; but when heath or grass growth is to be feared then planting is to be preferred. For hacking of these seed strips are selected places which are suitable for the growth of the seeds and protection of the plants, such as the north side of shading objects,—for example, stumps, windfalls, fixed rocks, etc. The seed is laid on the south corner of the seed strip so that seed and plant will be better shaded. When sown on

rocky land it has to be raked and covered by hand. On even ground the seed strips should be made in a direction from east to west, and the seeds not deep, harrowed down along the south border of the strips. On the other hand, on steep descents the seed strips should be laid horizontally, so that the seed, in case of heavy rain, shall not be washed down the hill. During the latest ten years there have been yearly about 2,400 acres sown with from 800 to 900 kilograms of conifer tree seed.

The planting of forest trees takes place on the company's land on a small scale and only where strong growth of grass hinders the growth of young forests. That is usual on good spruce land. There are planted four-year-old transplants from four to five feet apart, so that the number of plants on a tunnland (1.22 acres) varies between 2,250 and 3,500. The average number of trees standing on an acre at the time of cutting is very different, depending on previous cuttings. To more fully answer this question as to old forest on gravelly land which has not been subjected to other cuttings than the thinning of too crowded trees and cuttings of defective trees, the number of trees on two tracts, each of two and a half acres extent, have been counted with the following result: First tract, average pine land, pure stand of pine; average age, 135 years; average height, 85 feet; diameter measured 5 feet from ground. There were found 8 trees with diameter of 5 inches, 13 of 6 inches, 20 of 7 inches, 27 of 8 inches, 34 of 9 inches, 42 of 10 inches, 44 of 11 inches, 44 of 12 inches, 53 of 13 inches, 40 of 14 inches, 30 of 15 inches, 16 of 16 inches, 11 of 17 inches, 3 of 18 inches, 2 of 19 inches; total, 385 trees, containing 9,178 cubic feet. Second tract, good pine land; young spruce successively grown up; pine of average age of 130 years and average height 85 feet; there were found 3 pines and 37 spruces 5 inches in diameter, 44 pines and 58 spruces 6 inches, 61 pines and 37 spruces 7 inches, 77 pines and 28 spruces 8 inches, 76 pines and 11 spruces 9 inches, 82 pines

and 7 spruces 10 inches, 83 pines and 6 spruces 11 inches, 73 pines and 3 spruces 12 inches, 53 pines and 1 spruce 13 inches, 30 pines 14 inches, 14 pines 15 inches, 9 pines 16 inches, 5 pines 17 inches, 1 pine 19 inches, 2 pines 20 inches (in diameter); total, 613 pines and 188 spruces, in all 12,013 cubic feet.

Thus were found about 300 trees left per "tunnland" of about 5,300 cubic feet, which, according to an average age of 133 years, shows a yearly average growth of 40 cubic feet per "tunnland" (1.22 acres). If, on the other hand, timber cutting is done once or twice before the final cutting, as is usual, the number of trees at the last is much less. To prevent forest fires, during very dry weather, strict watch is kept by 30 forest guards and by extra ones, and in addition all of the company's dependents are obliged, when a forest fire breaks out, to send notice to the forest guard or forest manager and assist in extinguishing it. Generally the precautions are effective in preventing such fires. No forest fire worthy of mention has occurred in twenty years.

The company's land has been used for forest more than 100 years. It cannot be said what the net revenue is per acre, as the greater part of the product is used at the works in form of coal or fuel. The average yearly growth per "tunnland" ought to be 40 cubic feet, of which one fourth, or 10 cubic feet, should be saw timber of the net value of 1.50 kronor; 10 cubic feet of building timber, worth 1 kronor; 20 cubic feet of wood, worth 0.70 kronor, or, for the 40 cubic feet, 3.20 kronor (equal to \$0.85).

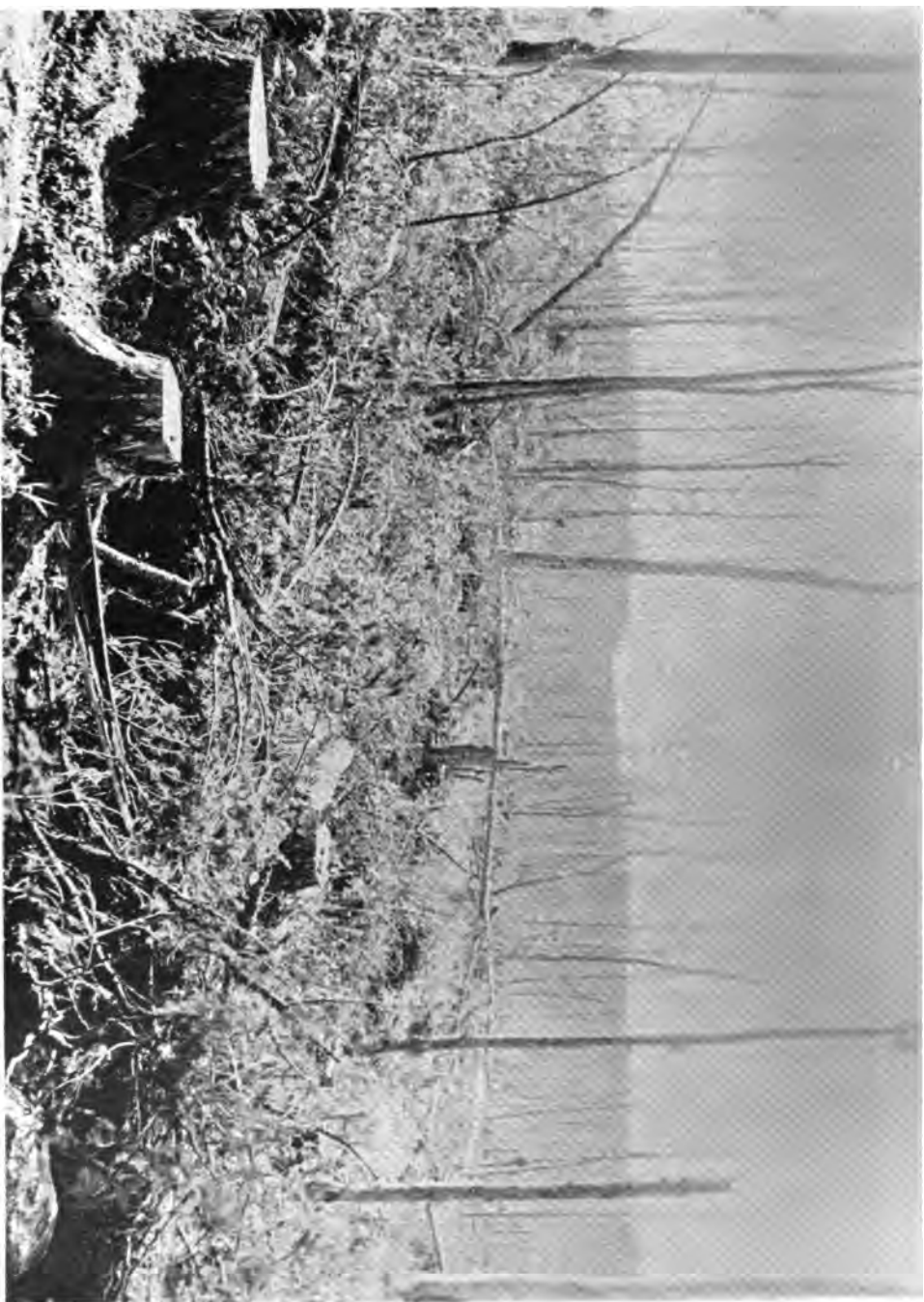
The income from game is not large. There are shot annually 12 elks, many hares and game birds.

#### ANOTHER SWEDISH FOREST MANAGED AS AN INVIOABLE INCOME YIELDING CAPITAL.

The forest of the Boxholm Company, situated in the province of Ostergotland, in the south central part of Sweden, on the principal railway from Copenhagen to Stock-

holm, and about sixty English miles southwest of the port of Norrköping, is managed on forestry principles; that is, it is managed with a view to a sustained yield, and for that reason a short account of its present situation will be of value. Including pastures, the forest comprises 55,000 acres, the surface is rather hilly, and 20 to 30 per cent of it is rocky; soil sandy and gravelly and for the most part unsuitable for agriculture. In the forest proper three-fourths of the trees are pine and one-fourth spruce; in the pastures birch pine and spruce together or mixed. On an average about 250 to 500 acres are cut over annually; and old forest generally yields 100 to 150 cubic meters per tunnland (one tunnland equals one and twenty-two hundredths of an acre), of which 70 per cent is merchantable timber. Hitherto the forest has been cut in stands having an age of 100 to 150 years or older, together with thinning in younger stands; on the high land the forest is usually cut at the age of 50 to 70 years, although clean cutting seldom occurs. The annual product is about 50,000 logs, 6 inches and upwards in diameter at the top; 20,000 cubic meters of charcoal and all timber required for building, repairs, fencing, etc.

Of the cut-over area on high land perhaps one-third part becomes reforested naturally by self-seeding. Cutting in strips is not practiced, but it is considered preferable to make small clearings, and first in that part of the forest which is more distant from the prevailing winds. To effect reforestation by sowing seed, the ground is first cleared of leaves, twigs and moss by burning, which usually is done in the spring or summer. The following year, or, if the burning takes place in the spring, then the same year if one chooses, the ground is then prepared in pieces a foot square, at proper intervals, and the seed sown in them. The first year the young plants are protected from pasture animals by fencing. About 2,500 pieces a foot square are sown per "tunnland." On grassy places planting occurs instead of sowing. Planting at the Boxholm forest is done



Pine slashings (tree tops and branches) left by lumbermen in St. Louis County. Such slashings, when left in the vicinity of settlements and villages, are liable in dry weather to produce fatal fires. Some of the principal lumbermen recommend the piling and burning of the slashings. Where they endanger settlements, villages or other people's valuable property, it would seem that this burning should be regulated by law. Photographed 1898, for the Annual Report of the Chief of the Division of Forestry.





partly with transplants (plants which had previously been taken from the nursery and set in other ground), which are set in holes either with the roots only or with the adhering clumps of earth; partly with seedlings (plants direct from the nursery or first bed), which are set in filled holes with a planting pin. Pine transplants are generally three and spruce four to five years old. When seedlings are used they are, if pine, generally one year old and spruce seedlings two to three years old. The number planted on a "tunnland" varies from 1,500 to 2,500.

The number of timber trees cut on a "tunnland" averages about 100. During even very dry seasons not much is done to prevent forest fires. The forest watchmen perhaps exercise more attention and employ more care, and generally the precautions against forest fires prevent their gaining any great extent. In case any part of the forest is burned, it is, after a couple year's time, resown to forest.

The cutting of timber in this forest has been in progress by the present company twenty-five years, and in previous years it had been operated for timber and charcoal.

There are scores of such forest properties in Sweden.

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## SWITZERLAND.

The Swiss Confederation is composed of twenty-two cantons, which are separate and sovereign states; and while each canton has legislative authority over forests, the Confederation also exercises legislative authority over them in certain regards. Under article 24 of the Federal Constitution of May 29, 1894, the Confederation controls only the forests of the high regions, which are about 65 per cent of the total forest area of Switzerland. It is true that since the popular vote of July 11, 1897, which revises the said article 24, the Confederation has from now on the right of inspection of the forest police of the whole of Switzerland.

The federal law of March 24, 1876, which puts into execution the above-named article 24 of the constitution, was promulgated for the forests of the high regions. By the terms of that law the inspection by the Confederation extends over the entire territory of the cantons of Uri, Schwytz, Unterwald, Glaris, Appenzell, Grisons, Tessin and Valais and over the mountainous parts of the cantonal territories of Zurich, Berne, Luzerne, Zoug, Friburg, St. Gall, Jura and Vaud; but the law does not apply to the forests of the plains of the last-mentioned states, nor to the forests of the cantons of Soleure, Bale, Schaffhouse, Argovie, Thurgovie, Neufchatel and Geneva.

The Confederation is not actually the owner of any forests, but a few of the separate states are owners. The forest domains are part of the national wealth, and comprise 91,587 acres. There are also in the cantons the forests of the municipalities and of the corporations, comprising 1,403,772 acres. Besides there are private forests, comprising 609,855 acres. The total area of forest is therefore 2,105,220 acres, or about 20 per cent of the total area of Switzerland.

Forests are found everywhere in Switzerland. The parts most heavily timbered are the mountain chains of Jura and of the cantons of Schaffhouse, Soleure, Argovie and Neufchatel. Forests are found starting at 200 meters above sea level (in the canton of Tessin) and reach as high as 2,100 meters in the high mountain. In Argovie they even reach 2,300 meters in altitude.

The more common varieties of trees are among the resinous kinds, the opicea, the fir, the larch, the Scotch and mountain pines, the Siberian pine; among the deciduous kinds, the birch and the chestnut tree; this last kind grows especially in the canton of Tessin.

The value of forest land varies greatly and depends on the location, the nature of the soil, thickness of the settlements, the increase of these settlements and on the trade

in timber and other products of the forest. The value per hectare ( $2\frac{1}{2}$  acres) may range accordingly from 300 francs to 6,000 francs.

In regard to expenses of administration, a distinction must be made between the expenses incurred by the Confederation and those incurred by the cantons. In 1897 the expenses incurred by the Confederation for forest administration amounted to \$56,000.

The following are the net receipts from forests in 1896 as to a few cantons:

Zurich, 180,900 francs, or 91.06 francs per hectare of forest.

Berne, 893,000 francs, or 71 francs per hectare of forest.

Soleure, 33,400 francs, or 44 francs per hectare of forest.

St. Gall, 71,000 francs, or 84.60 francs per hectare of forest.

Argovie, 241,000 francs, or 78.73 francs per hectare of forest.

Vaud, 236,000 francs, or 32 francs per hectare of forest.

The net receipts from town and municipal corporation forests in 1896 were:

Canton of Grisons, 1,200,000 francs, or 10.40 francs per hectare of forest.

Canton of Argovie, 2,378,000 francs, or 70.60 francs per hectare of forest.

On an average about 412 acres of forest have been created annually during the past twenty years, at the expense of the federal treasury.

In order to regenerate the forests, both planting and natural seeding are practiced, as may be most effective. In the lowest countries, where clean cutting is practiced, planting is resorted to. Where real dangers exist from avalanches, land-slidings, etc., which do not permit complete denudation, and where gardening is required, natural modes of regeneration are generally used, and sowing is seldom done.

Reforestation by the Confederation in high mountain regions costs on an average 400 francs per hectare for 6,000 to 7,000 plants set in their places.

The federal and cantonal legislations prescribe a sustained production for the forests of the state, of the towns and of the municipal corporations. If, through winds, snow-slidings or otherwise, too much timber has been destroyed, less cutting is done in the following years, in order that as rapidly as possible the forest may regain the number of trees fixed by the management. The forests are operated in various ways, according to localities and according to the size of timber that is to be grown, viz., high forest, undergrowth and coppice (*de hautes futaies, de taillis sous futaie ou de taillis simples*), which three modes of management are found in Switzerland.

In accordance with the terms of the federal law, the forest area cannot be reduced. The cleared land must consequently be reforested except in cases where an equal area of land is converted into forest. Furthermore, the cantons as well as the Confederation have the right to compel the creation of protective forests wherever they are needed for public utility.

Forest fires seldom occur. Of those which do occur the principal causes are carelessness in lighting fires in the immediate vicinity of the forests, and lack of care in the woods. It is rare that a forest fire is occasioned by locomotives.

The administration charged to execute the federal forest law is the Federal Inspectorate of Forests, forming a part of the Swiss federal department of the interior. Nearly all the cantons have for their territories a forest administration. In the small states one single technical official is at the head of the service, but in the larger cantons the administration is under the direction of one or more chief forest inspectors or chiefs of the service and of several district foresters or forest inspectors. An inferior personnel instructed for the federal zone in courses lasting two months is attached to this technical personnel, and is organized to execute the work of forest economy.

A few cities or towns with extended and important forests have also a self forest administration, at the head of which is a person of technical forest training. Among them are Zurich, Berne, Lausanne, St. Gall, Winterhue, Friburg, Coire, Soleure, Schaffhouse.

The Chief Federal Inspector of Forests has an annual salary of 8,000 francs and fees of eight francs per day, and eight francs per night, when he has to be absent, for his service; he gets his traveling expenses reimbursed; his first assistant has a salary of 6,400 francs and is similarly indemnified for his inspection trips.

The three inspectors of the canton of Berne receive each 5,300 francs per annum. They receive extra pay, six francs per day and four francs per night, for all inspections made outside of their city, and their traveling expenses are reimbursed.

The high forester or chief inspector of the canton of St. Gall, who has a salary of 5,000 francs, receives ten francs per day and four francs per night, besides his traveling expenses, when out inspecting.

The Federal Inspectorate of Forests publishes every year a report on its management. The majority of the cantonal inspectors do likewise.

The following are monthly forestry publications:

Journal Suisse d'Economie forestiere; Der prattische Forsturett.

In the matter of taxes, the cantons are sovereign in their own limits. Taxation therefore differs according to the cantonal territory to which it applies. In all these states a tax on the fortune is imposed, and in most states that tax is combined with the tax on income. But for one and the same forest only one of these two modes of taxation is generally applied. A few examples will show: In the canton of St. Gall the state has paid to the towns in which it has forests a tax of 1.20 francs per hectare.

In Argovie the state pays to the towns where its forests are situated a tax of 2.40 to 3.20 francs per 1,000 francs of forest value. On the other hand, the towns only pay to the state a tax of 40 centimes per 1,000 francs of forest value. The private forest proprietor pays to the state 40 centimes and from 2.40 francs to 3.20 francs to the towns per 1,000 francs of forest value; and in addition thereto he is taxed on the income in the amount of one per cent of the average two per cent of gross declared value of the forest, but neither the state nor the towns pay a tax on the income of their forests.

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## WURTEMBERG.

Wurtemberg lies west of Bavaria, and is the third German state in point of area, its population being a little over 2,000,000. Its greatest length from north to south is 140 miles, and its greatest breadth is 100 miles. One-third of the Black Forest (so called from the dark foliage of its pines, and which forms a sort of a triangle) lies within Wurtemberg, two-thirds being in Baden. The Black Forest has a total length of 93 miles, and its breadth varies from 13 to 46 miles.

### STATE FORESTS.

The aggregate extent of the state forests is 418,904 acres, and they extend over the entire kingdom. Fifty-nine per cent of the forests consists of pine, 20 per cent being pitch pine and 9 per cent white pine. The estimated value of the forest land varies from \$29 to \$58 per acre. The annual aggregate expense of administration of the forest amounts to \$1,183,574. Of this \$364,140 is paid to wood-cutters, \$147,560 is expended on roads, \$90,440 in forest culture, \$259,468 for pay of officials, \$148,468 for forest guards. The revenue was \$2,928,352, yielding a net revenue, after for 1895-1896 deducting all expenditures, of \$1,744,788, or \$3.63 per acre. The number of acres annually sown to

forest is 296, and the number of acres planted to forest 6,177.

In regard to reforestation, when the natural seeding of the desired kind of wood occurs in proper time the same is used; otherwise planting or artificial growing takes place. Natural sowing is estimated at about 25 per cent; artificial renewing amounts to about 75 per cent. The latter is almost exclusively done by planting, whereas sowing in free woodland is very seldom applied. It is a principle to maintain (as far as the division of the age of the plantings permit) an equal annual cutting. At present the cutting is fixed at 1.94 cubic meters per acre. The cutting is contracted for with laborers living in the neighborhood of the woods. By good management there are at a given plot generally trees of about the same age. If the natural seed falling is intended to be used, the larger trees, either single or in crops, are cut out in a direction against the prevailing winds; the remaining trees are thinned and gradually cut out as the growing young trees may demand. If the natural seed falling is not taken into consideration, the wood crop is cut clean in narrow strips, also in a direction against the prevailing winds, and the cutting of the second and following strips is postponed until the young plantings can dispense with the side protection of the old woods. It is a principle that replanting follows immediately after the cuttings. Moreover, the state buys every year about 400 acres of woodland to increase and round off the forests.

The amount of damage annually caused by forest fires is only \$642.60, and the principal cause of such fires is carelessness and negligence while smoking and lighting fires in or near the forests. In the last ten years out of 120 forest fires only 8 were caused by sparks from locomotives, and of these only one caused considerable damage (about \$3,570).

In regard to the rank in the forest service, as compared with other branches of the public service, it may be said



that the forest officials rank in general equally with those state officials who are graduates of the university. The Department of Forests is directed by one president, four technical and four administrative members and one commander of the forest guards. The salary of the president is \$1,844.50 per year; the salary of the members of the Board of Direction is from \$1,190 to \$1,618. A work entitled "The Forests of Wurtemberg," published by Rueger Stuttgart, 1880, gives a fair review of the situation of the forestry of the country. It may here be stated that in respect to net revenue Saxony and Wurtemberg stand at the head of forest administration and forest culture in general.

#### PRIVATE FORESTS.

The aggregate extent of private forests is 528,794 acres, of which 210,000 acres are administered by technical forest officials; the remainder is also administered in a proper manner. As the permission of the government is required for cutting and replanting of forest lands, and this permission is only given under the condition that an equal area to what has been cut shall be planted, the aggregate area of forest land remains the same throughout the whole country; but portions of it are gradually coming into the possession of the state government.

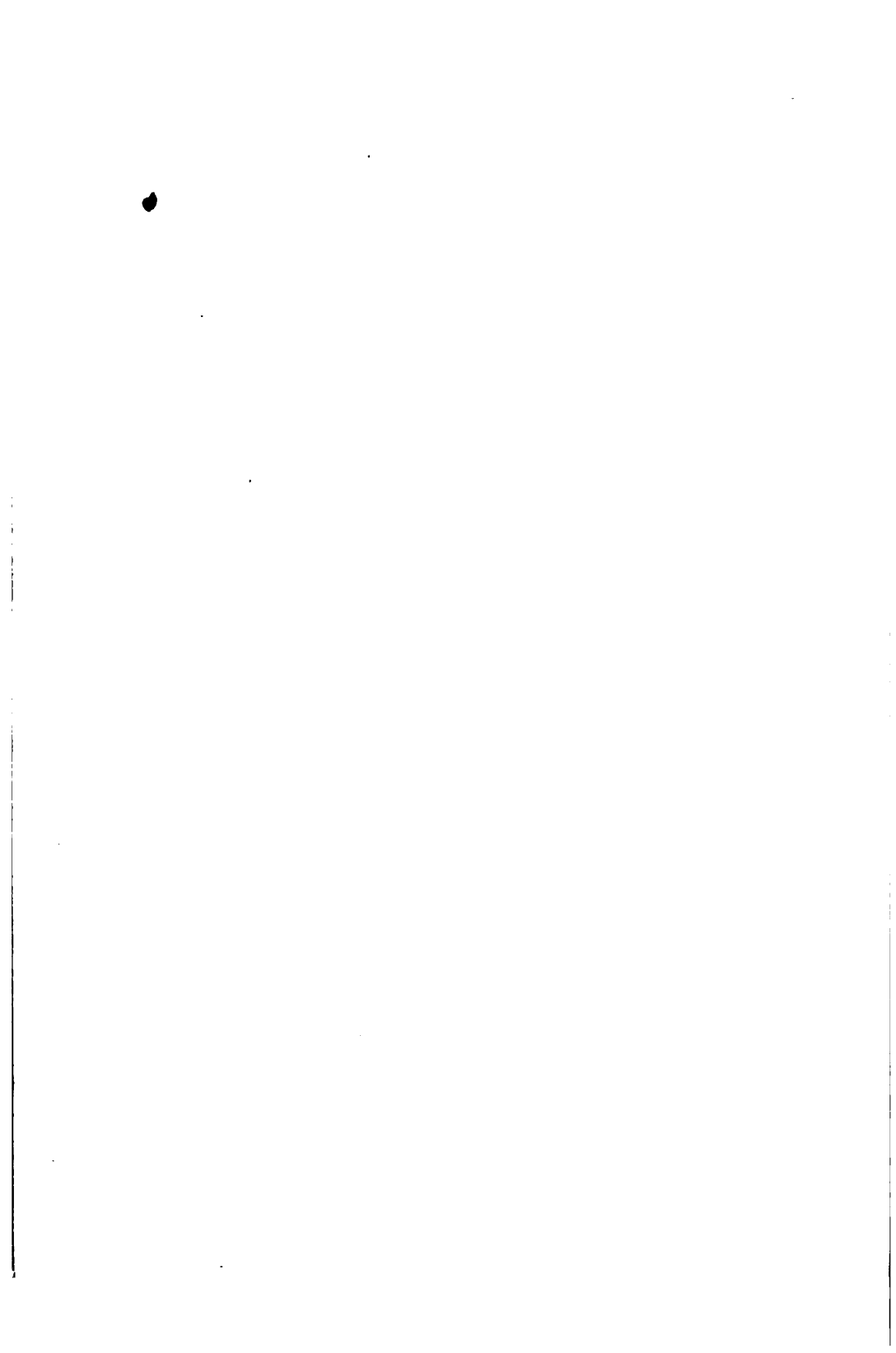
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#### THE PROGRESS OF FORESTRY IN THIS COUNTRY.

The past year has witnessed the triumph of the policy of permanent forest reserves. The United States government has set apart 46,000,000 acres of mountain lands as such reserves and has appointed superintendents and rangers to assist in their administration, and their protection from fire. They are being surveyed under charge of the Director of the Geological Surveys. For the first time in the history of our country, the President, in his (last)



Primeval Norway and young white pine given to the State University by the United States and situated on the north shore of Vermillion Lake. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



annual message, devoted space to forestry and the need of precautions against forest fires.

The Minnesota State Forestry Board was organized June 26, 1899, by the election of Judson N. Cross, of Minneapolis, as president; Greenleaf Clark, of St. Paul, vice president, and C. C. Andrews, of St. Paul, secretary. The board is composed of the following nine members: C. C. Andrews, Chief Fire Warden, and Samuel B. Green, Horticulturist in the State University, ex-officio members; John Cooper, of St. Cloud; Frederick Weyerhaeuser, of St. Paul, and O. M. Lord, of Minnesota City, recommended by the regents of the State University, and to hold for four years; Judson N. Cross, of Minneapolis, recommended by the State Forestry Association; Greenleaf Clark, of St. Paul, recommended by the State Agricultural Society; William Mitchell, of Winona, recommended by the Game and Fish Commission; and A. L. Cole, of Motley. Charles A. Duncan, of Duluth, was recommended by the State Horticultural Society, but, as he declined, the governor appointed Mr. Cole.

The legislature of Michigan, at its last session, passed an important act creating a forestry commission of three members, charged with a thorough inquiry into the forest resources of the state, the injury being done by forest fires, etc., and to report by bill or bills to the legislature which will meet in 1901. On its recommendation the state land office is to withdraw from sale two hundred thousand acres of land belonging to the state. The commission is authorized to receive, by deed to the state, from the owners, any tracts of land which, in its judgment, may be suitable as forest reserves.

The Chief of the Division of Forestry, Washington, D. C., last year issued a circular offering to furnish forest working plans on certain conditions to private individuals. Many are availing of this offer. Mr. Reed, of Anoka, a lumber-

man, is having 1,000 acres treated on this plan. Over 100,000 acres of spruce forest in the Adirondacks, properties of Dr. W. Seward Webb, Hon. William C. Whitney and Mr. Patrick Moynahan, are being operated on plans furnished by the Division of Forestry.

A few owners of extensive forest tracts are employing foresters to assist in their operations with a view partly to conserve their timber resources. For example, the Berlin Mills Company, of New Hampshire, owning some 300,000 acres of spruce land, and who manufacture lumber, pulp and news paper, employ Mr. Austin Cary as a forester, who has examined large portions of their holdings, studying the amount and condition of the timber. A main part of his work is also the construction of topographical maps, which facilitate planning and controlling logging work. The cut which is now yearly being made by that company, if kept up, will exhaust the timber in a few decades. However, the owners believe that in some places conservation cutting will pay, because it will provide a second crop, yielding more stumpage. Mr. Cary has been present during the cutting season, seeing that the work went on economically. The International Paper Company, of Berlin, New Hampshire, owns or controls about 1,000,000 acres of spruce timber land, situated mostly in Maine, Vermont, New Hampshire and New York, and employs Mr. E. M. Griffith as forester. He has made working plans for 123,000 acres in New Hampshire and Maine which will limit the cutting of spruce to 14 inches on the stump. The fir (*abies balsamea*) will be cut to 5 inches, as it is their wish to regenerate to spruce. They expect to cut on a rotation of 25 years, and to have standing timber tributary to each mill of sufficient size and stand of spruce to furnish the supply of logs and peeled wood indefinitely. The company applied to the Division of Forestry for detailed working plans for 500,000 acres, and Mr. Griffith, who is furloughed from the Division of Forestry, is assisting in the work. Mr. Griffith, after

studying subjects associated with forestry in Yale University, pursued the study and practice of forestry in Germany, and, after returning to this country, studied and worked under Dr. C. A. Schenck, superintendent of Mr. George W. Vanderbilt's forests at Biltmore, N. C. Mr. George T. Crawford, of Boston, is a well-known practical forester, who has had many years' experience, and is extensively employed in making estimates and reports on timber properties in New England and Canada. Certainly there is increasing tendency to regard the intimate and friendly relations which ought to exist between forestry and lumbering.

"Forestry in Minnesota," an illustrated hand-book of 312 pages, by Professor Samuel B. Green, published by the Minnesota Forestry Association and distributed by its secretary, Mr. George W. Strand, of Taylor's Falls, Minn.; "The Adirondack Spruce," an illustrated hand-book of 157 pages, by Mr. Gifford Pinchot, chief of the Division of Forestry; and the report of the Forestry Commission of Wisconsin, were particularly valuable contributions to American forestry literature the past year.

#### DESTRUCTION OF SCENERY.

The public cannot too deeply be impressed of the importance of preventing forest fires, if only for the preservation of our scenery. How they wipe out property—how dreadful they are to women and children whose humble homes are in woodland regions—most people can imagine. But it needs one to open his eyes upon the miles and miles and scores of miles of blackened and dead forests that have been killed by fire along our railroads to comprehend what it is to destroy scenery. A living forest bordering a railway is beautiful. Turned into a dismal waste of tree skeletons by fire, it is horrible, and remains for years an advertisement to all travelers of criminal carelessness and semi-

civilization. Such scenery we might expect to see in the heart of Africa, but not in a country like ours, which feels itself to be glorious; and that man who is indifferent to using some means for preventing forest fires is either indifferent to the welfare of his state or has not duly considered the subject.

Respectfully submitted,

C. C. ANDREWS,  
*Chief Fire Warden.*

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